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KUNGLIGA SVENSKA

VETENSKAPSAKADEMIENS

HANDLINGAR

TREDJE SERIEN

ÅTTONDE BANDET

INNEHÅLL:

Sid.

1. Hultén, E., Flora of Kamtchatka and the adjacent islands. III. Dicotyledoneae Droseraceae — Cornaceae. With 3 plates . . . . . 1—213
2. — —, Flora of Kamtchatka and the adjacent islands. IV. Dicotyledoneae Pyrolaceae — Compositae. With 6 plates . . . . . 1—358

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STOCKHOLM
ALMQVIST & WIKSELLS BOKTRYCKERI-A.-B.
1930

UPPSALA 1930
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KUNGL. SVENSKA VETENSKAPSAKADEMIENS HANDLINGAR
TREDJE SERIEN. BAND 8. N:O 1.

FLORA OF KAMTCHATKA AND THE ADJACENT ISLANDS

BY

ERIC HULTÉN

III

DICOTYLEDONEAE

DROSERACEAE — CORNACEAE

WITH 3 PLATES AND 18 FIGURES IN THE TEXT

COMMUNICATED JANUARY 9th 1929 BY O. ROSENBERG AND R. E. FRIES

Printed with contribution from
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STOCKHOLM
ALMQVIST & WIKSELLS BOKTRYCKERI-A.-B.
1929

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Continued from

Kungl. Svenska Vetenskapsakademiens Handlingar

Tredje Serien. Band 5. No. 1 and No. 2

Droseraceae DC.

460. ***Drosera anglica*** Huds., Fl. angl. ed. 2 (1778) p. 135.

Mertens, Bemerk. fl. Koragins p. 65; Cham. in Linnaea VI (1831) p. 589; Erman, Verzeichn. p. 62; Diels in Engler, Pflanzenr. IV: 112 (Heft 26) p. 96. — *Drosera longifolia* L. (pro parte), Ledeb., Fl. Ross. I p. 261.

South Kamtchatka: Near Javina noted by Hn; the watershed between Shadutka and Ksudach rivers 250 m. Aug. 4th 1921 Hn No. 2624; the mouth of Bolshaja R. noted by Hn; lower Bolshaja R. noted in A. 110 b; Bystraja R. 12 verst from Bolsheredsk Rubinski 1908; Paratunka R. Komarov 1908 (also sub *D. intermedia*); Lake Blishne Komarov sub *D. intermedia*; Lake Natchika, western shore Komarov 1908.

East Kamtchatka: Between Petropavlovsk and Avatcha volcano 250 m. Aug. 6th 1920 Hn No. 756 a, do. Aug. 28th 1920 Hn No. 1095.

West and North Kamtchatka: Jelovka acc. to Erman loc. cit., Karaginsk Island acc. to Mertens loc. cit.

»Kamtchatka»: Stewart acc. to Diels loc. cit., »Rieder Kamt. ad Erman».

Noted in the following association:

In *Carex—Sphagnum* ass.:
Single (A. 110 b).

In South Kamtchatka this plant is fairly common on the edge of ponds and in the wet destruction-spots of the *Sphagnum* bogs. It prefers wetter places than *D. rotundifolia,* which grows on the *Sphagnum* knolls.

Our plant differs considerably from the common Scandinavian type and comes very close to var. *pusilla* Kihlm. to which it might belong. The scape bears only 1—3 flowers, the average length of the leaves is 30 mm. (the blade 15 mm.) and the average breadth 2,9 mm., while the corresponding figures of the Swedish plant acc. to Rosenberg (Kungl. Sv. Vet. Akad. Handl. 43 (1909) No. 11 p. 8) are 56 mm., 24 mm. and 3,7 mm. The flowers of var. *pusilla* are considerably larger than those of the type and it is certainly a pronounced geographical race. All specimens that I have seen from Amur Prov., Udskoj distr., Primorsk Prov., and Saghalin belong to this variety. From the European—Eastern American *D. intermedia* Hayne all forms of *D. anglica*

are easily distinguished *inter alia* by the basal part of the scape, which in that species is characteristically curved, forming at first a horizontal or even a descending bow.

When LINNAEUS described his *D. longifolia* he certainly had chiefly in mind the plant now in question, but he apparently also included the smaller plant later named *D. intermedia* HAYNE. HUDSON (Fl. Angl. ed. 2) realized that these plants belong to different species, but judging from the quotation of synonyms thought that LINNAEUS' *D. longifolia* was the smaller of the two plants, which is more common in England, and he therefore kept the name *D. longifolia* for this plant, giving the higher-grown plant the name *D. anglica*. The name *D. longifolia* has since been used for now one, now another of these species. As far as I can see, our plant must according to the Vienna rules bear the name *D. anglica*.

Type of distribution: Circumpolar.

Geographical area: Europe: from the British Isles, northernmost Scandinavia, Kola penins. and northern Russia southwards to the Pyrenees, the Alps, Kursk, Saratov and Orenburg. Asia: at Yenisei from about 68° N. lat., Saghalin and Kamtchatka, southwards to Tomsk prov., southern Irkutsk prov., Primorsk prov. and Honshu. America: from Alaska 55° N. lat. to Newfoundland 53° N. lat., southwards to California 39° N. lat. and Gaspé Peninsula 48° N. lat. Also in Sandwich Islands.

Drosera anglica × *rotundifolia*.

Drosera longifolia β obovata REGEL, Pl. Radd. Dicotyl. Polypet. No. 268 in Bull. Mosc. 34: 2 (1861) p. 503 et RADDE, Reisen I: 2 p. 258.

East Kamtchatka: Between Petropavlovsk and Avatcha volcano 250 m. Aug. 6th 1920 HN No. 756 b.

»Kamtchatka»: STEWART, RIEDER 1833 sub *D. obovata*.

This hybrid is not rare in places where the two species occur together.

461. ***Drosera rotundifolia*** L., Sp. pl. ed. I (1753) p. 281.

REGEL, Pl. Radd. Dicotyl. Polypet. No. 267 in Bull. Mosc. 34: 2 (1861) p. 502 et RADDE, Reisen I: 2 p. 257 (*α typica, β breviscapa*); FEDTSCH., Fl. îl. Comm. p. 43; KOM., Voy. Kamtch. p. 454; KUDO, Fl. Paramush. p. 115.

Northern Kuriles: Paramushir T. MATSUBARA 1915, KUDO 1920.

South Kamtchatka: Lower Ozernaja R. noted by HN; near Javina village noted by HN; Kusingen R. near Sahach noted by HN; the watershed between Ksudach and Shadutka rivers 250 m. Aug. 4th 1921 HN No. 2625; the hot spring at upper Opala R. noted in A. 181; Akhomten Bay Sept. 10th 1920 HN No. 1240; Zykovaja village noted in A. 103; near the mouth of Bolshaja R. noted in A. 50; lower Bolshaja R. noted in A. 110, A. 111; Bystraja R. 12 verst from Bolsheredsk RUBINSKI 1908; upper Bannaja R. noted by HN; Tarja Bay Aug. 23rd 1920 HN No. 559 (MALAISE); Bogatyrjovka

July 16th 1920 Hn No. 426; Lake Natchika, western shore Komarov 1908 (Hb. Berol.); the hot spring at Natchika Komarov 1908; Hutor July 19th 1928 W. Eyerdam.

East Kamtchatka: Petropavlovsk Komarov 1908; between Petropavlovsk and Avatcha Volcano noted in A. 20; the mouth of Haliger R. Komarov 1909; Lake Kronoki Komarov 1909.

Commander Islands: Bering Island Stejneger 1897 and Morozevicz 1903 acc. to Fedtsch. loc. cit.; Copper Island Stejneger 1883 acc. to Fedtsch. loc. cit.

Central Kamtchatka: Malka Komarov 1909.

West and North Kamtchatka: Krotugorovaja Bezais 1909; Tigil Levitzky sub *D. obovata*; Karaginsk Island Mertens.

»Kamtchatka»: Stewart, Rieder and Peters sub *D. rotundifolia β breviscapa.*

Noted in the following associations:

In *Carex—Sphagnum* ass.:
Single (A. 50); Sparse (A. 103).
In *Carex—Myrica—Sphagnum* ass.:
Single (A. 20, A. 111).
In *Carex—Myrica* ass.:
Single (A. 110).
In *Carex—Sanguisorba*—Moss ass.:
Scattered (A. 181).

In South Kamtchatka *D. rotundifolia* is fairly common in the *Sphagnum* bogs and swamps.

Practically the whole of the Kamtchatka material of this plant consists of a form with very small leaves (about 4 mm. in diameter) and 1—4 flowers, which, especially in a late stage of development, are comparatively large. They agree closely with the northern Scandinavian form named by Laestadius var. *gracilis.* They seem to represent a special race of the species.

Var. *breviscapa* Regel is only an ecological form grown up among grass, corresponding to my No. 426.

Diels in Engler, Pflanzenreich IV: 112 (Heft 26) gives a map showing the distribution of the sections of the genus *Drosera.* He there draws the boundary-line for sect. *Rossolis* north of Lake Baikal in a bowline up towards the Aldan river. *D. rotundifolia*, however, occurs in the Sajan Mts., in Dahuria, in Sikoku, Kiushiu and in Corea (acc. to Kudo 1925 also in China) and this boundary-line must thus be drawn considerably further to the south in Eastern Asia. Also, the northern limitation seems to go further to the south than the dotted line in the map of Diels indicates.

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland, northernmost Scandinavia, Kola

and northern Russia southwards to Portugal (40° N. lat.), northern Spain, Corsica, northern Italy, northern Balkans, Poltava, Jekaterinoslav and Orenburg. Asia: from Vilju, Olekminsk and Jakutsk districts and Kamtchatka southwards to Tomsk prov., southern Irkutsk prov., Amur prov.. Saghalin, Corea, Sikoku and Kiushiu, also in Syria. America: from Alaska to Labrador and Newfoundland, southwards to California, Montana, Minnesota and Pennsylvania, also acc. to SMALL in Florida and Alabama. Southernmost Greenland. A map of the eastern American distribution is given by FERNALD in Mem. Gray Herb. II (1925) p. 319 fig. 50.

Crassulaceae DC.[1]

462. ***Sedum Aizoon*** L., Sp. Pl. ed. I (1753) p. 430.

subsp. ***kamtschaticum*** (FISCH.) nov. comb.

Sedum kamtschaticum FISCH. in Index Sem. Hort. Petrop. VII (1841) p. 51; LEDEB., Fl. Ross. II p. 182; MAXIM. in Mél. Biol. XI (1883) p. 759. — ? *Sedum Aizoon* MAXIM. in Mél. Biol. XI (1883) p. 756.

South Kamtchatka: Lower Ozernaja R. 10 km. E. of the village Aug. 12th 1921 HN No. 2804; the hot spring at upper Unkanakchek R. Aug. 19th 1922 HN No. 4323; Paratunka STUBENDORFF; Bogatyrjovka July 16th 1920 HN No. 464; Palovinaja valley (Savoiko) KOMAROV 1908; Avatcha Bay VOSSNESENSKY 1847.

East Kamtchatka: Petropavlovsk MERTENS, do. DYBOVSKY 1879, do. GUDZENKO 1910, do. PERFILJEV 1910, do. July 21st 1920 HN No. 535, do. Aug. 17th 1920 HN No. 925.

Central Kamtchatka: Below Kirganik KOMAROV 1909; Kunchekla KOMAROV 1909; Shtchapina KOMAROV 1909.

West and North Kamtchatka: Tigil LEVITZKY, do. BEZAIS 1909.

»Kamtchatka»: LANGSDORFF, ESCHSCHOLTZ, LUBARSKY, STEWART, KASTALSKY (sub *S. Aizoon*), RIEDER, »Hb. Fisch.» (sub *S.* an *Aizoon*, *Kamtschaticum* FISCH. teste MAXIM.).

This plant is rarely found in South Kamtchatka, only seen in the abovementioned places. At Petropavlovsk it is abundant on »Mt. Nikkolska» near the harbour. It flowers in July and August.

Acc. to the original diagnosis of *S. kamtschaticum* it was introduced into Hort. Petrop. by DOBELL in 1840.

Of the specimens collected by myself, No. 2804 is the most typical »*S. kamtschaticum*», while No. 4323, owing to its stout habitus, forms a link in the chain towards *S. Aizoon* L. *β latifolium* MAXIM., known from Manchuria. Between *S. Aizoon*, *S. Selskianum*, *S. kamtschaticum* and *S. Middendorffianum*

[1] Determined (except *S. verticillatum*) by Dr. H. FRÖDERSTRÖM.

there seem to be rather diffuse limits in Eastern Asia and as no definit limits between those forms can be given they are here taken as subspecies of *S. Aizoon*.

Type of distribution: Asiatic.

Geographical area: The entire species: From the Urals eastwards, at Yenisei from about 60° N. lat., from Kolyma R., Gishiginsk distr. and northern Kamtchatka southwards to Sajan Mts., Sze-ch'uan and southern Japan. E. of Lake Baikal part of the specimens belong to subsp. *kamtschaticum*.

Sedum cyaneum RUDOLPH.

MAXIM. in Mel. Biol. XI (1883) p. 744.

This plant is represented by three specimens labelled respectively »Kamtchatka» (collector unknown), »Kamtschatka Hb. MEYER» (collector unknown) and »Kamtchatka REDOWSKY». Even MAXIMOVICZ loc. cit. denies the existence of *S. cyaneum* in Kamtchatka and the specimens enumerated above must all be regarded as uncertain. As however it exists so near as in the Gishiginsk distr. it might be expected in the northern part of our area.

463. ***Sedum roseum*** (L.) SCOPOLI, Fl. Carniol. I ed. 2 (1772) p. 326.

KUDO, Fl. Paramush. p. 115. — *Sedum Rhodiola* DC., CHAM. & SCHLECHT. in Linnaea VI (1831) p. 548; HOOK. et ARNOTT in BEECHY's Voy. p. 114; ERMAN, Verzeichn. p. 63; MAXIM. in Mél. Biol. XI (1863) p. 734 (*β elongatum*, *γ atropurpureum*); YABE & YENDO, Fl. Shimushu p. (184). — *Sedum elongatum* LEDEB., Fl. Ross. II p. 178.

Northern Kuriles: Paramushir M. AIZAWA 1900 acc. to KUDO loc. cit., KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka June 19th 1920 HN No. 42, do. June 24th 1920 HN No. 130 (both var. *atropurpureum*); N. W. of Kurile Lake 1050 m. noted by HN; Topik volcano 580 m. July 28th 1921 HN No. 2498; Assatcha Mts. 600 m. noted by HN; Lake Tolmachovaja 600 m. July 13th 1922 HN No. 3910 (var. *atropurpureum*); the Kohelok Pass 750 m. Sept. 11th 1921 HN No. 3134; the hot springs at Bannaja July 31st 1924 P. T. NOVOGRABLENOF (var. *atropurpureum*); Mt. »Zaikin Mys» Paratunka KOMAROV 1908 (var. *atropurpureum*); Lake Natchika, eastern side KOMAROV 1908; Shalsan July 26th 1848 VOSSNESENSKY (var. *atropurpureum*); the Shalsan Pass 700 m. Sept. 1st 1921 HN No. 2984 g; Ozdets R. RUBINSKI 1908 (var. *atropurpureum*); »Avatscha Bay» acc. to HOOK. & ARNOTT loc. cit.

East Kamtchatka: The Kronoki Pass KOMAROV 1909; Klutchevskaja volcano 3600 feet BEZAIS 1908, do. KOZLOVSKI 1909, do. Aug. 6th 1927 MALAISE (all var. *atropurpureum*); Ploskaja volcano PROTOPOPOF 1909 (var. *atropurpureum*); Ustj Kamtchatka July 15th—30th 1925 MALAISE.

Central Kamtchatka: Gremushej R. KOMAROV 1908 (var. *atropurpureum*); Mt. »Ganalski vystraki» July 18th 1924 (var. *atropurpureum*); Kamtchatka

Vershina GRINOP 1909 Hb. Berol.; between Ganala and Pushtchina GRINOP 1909, Klutchi AFANASEJEV 1909.

West and North Kamtchatka: The mouth of Itcha river BJELOUSSOF 1914; between Sedanka and Jelovka BEZAIS 1909 (var. *atropurpureum*); »Westabhang des Sedanker Gebirges» acc. to ERMAN loc. cit.; Uka Sept. 14th 1920 KOZLOVSKI (Hb. Holm.); 6 werst S. W. of Pallan SAVTCHENKO 1911 (var. *atropurpureum*); Karaginsk Island MERTENS acc. to MAXIM. loc. cit. (var. *atropurpureum*).

»Kamtchatka»: STEWART acc. to MAXIM. loc. cit., RIEDER acc. to MAXIM. loc. cit. (var. *atropurpureum*).

In rocky places in the alpine region this plant is not rare. It flowers from the beginning of June to the end of August.

The specimens belong partly to var. *α vulgare* MAXIM. and *β elongatum* MAXIM. (which are hardly separable) and partly to var. *γ atropurpureum* MAXIM. The latter variety apparently does not occur in Europe or Western Siberia, but is very common in Eastern Siberia, in Alaska and along the Rocky Mts. to New Mexico. Possibly it may also be related to the central Asiatic *S. bupleuroides*-group. However, REGEL had already found that the dark colour of the petals is not constant during cultivation, but that yellow-flowered forms sometimes grow from seeds of dark flowered forms. No. 3910 is very close to *Rhodiola alaskana* ROSE. In the high mountains and on the nearly arctic west coast (for inst. HN Nos. 42 and 130) the plant attains a dwarf growth corresponding to similar forms of the European plant.

Type of distribution: ?Eurasiatic transgressing into Eastern and Western America.

Geographical area: Europe: Iceland, Beeren Island, Spitzbergen (one locality on Prince Charles Foreland), Nova Zembla, Scandinavian mts., Kola, arctic Russia and the Urals southwards to Orenburg, also in the Pyrenees, the Alps, the Vosges, the Sudets and the Carpathians. Asia: along the North Coast to Chukch Peninsula and southwards in the mts. to Pamir, Tibet, Mongolia, Sze-ch'uan, Saghalin and Honshu. America (acc. to FERNALD 1925): Alaska 70° N. lat. to British Columbia 53° N. lat. and Labrador 60° N. lat. to Maine with isolated localities to 40° N. lat. (not reported from the Arctic Archipelago). W. Greenland from about 68° N. lat., E. Greenland from 75° N. lat. southwards. In Western America the closely related purple-flowered *Rhodiola alaskana* ROSE, *S. integrifolium* NELS. (from Alaska to California and Colorado acc. to STANDLEY 1921), *S. polygamum* RYDB. (Colorado and New Mexico) and the yellow-flowered *Rhodiola neomexicana* BRITTON (White Mt. pike, New Mexico). In S. E. North America *S. roanense* BRITT. (N. Carol.).

Sedum Stephani CHAM.

LEDEB., Fl. Ross. II p. 178; MAXIM. in Mél. Biol. XI (1883) p. 732.

This species is reported by LEDEBOUR on the specimen No. 8910 in Hb. WILLD. (from Hb. PALLAS) and on REDOWSKY specimens. As REDOWSKY did not visit

our area only the first mentioned plant could possibly be collected there. It should, however, probably be excluded from the flora of our area.

464. ***Sedum Telephium*** L., Sp. pl. ed. I (1753) p. 430.

var. ***purpureum*** L. loc. cit.

CHAMISSO in Linnaea VI (1831) p. 550; ERMAN, Verzeichn. p. 63; MAXIM. in Mél. Biol. XI (1883) p. 752 (*β. purpureum, δ pluricaule*). — *Sedum purpureum* LINK., LEDEB., Fl. Ross. II p. 181.

South Kamtchatka: Assatcha Mts. at the sources of Opala R. noted by HN; middle Karymchina R. 220 m. Sept. 7th 1921 HN No. 3076; the hot springs at upper Karymchina R. 400 m. Sept. 10th 1921 HN No. 3100, on hot ground at Karymchina R. noted by HN; the hot spring »Malenki Klutchik», Bannaja R. 375 m. Sept. 12th 1921 HN No. 3146; the hot springs at upper Paratunka R. RUBINSKI 1909; Paratunka STUBENDORFF; Lake Dalni KOMAROV 1908; Toporkoff Island, Sarannaja Bay Aug. 8th 1920 HN No. 806; Natchika July 1848 VOSSNESENSKY; Mt. Zerkalo, Natchika KOMAROV 1908; Poperochnaja R. KOMAROV 1908; Savoiko July 7th 1920 HN No. 277; Korjaka (Korjatskaja Ostrochka) Aug. 1848 VOSSNESENSKY.

East Kamtchatka: Petropavlovsk RIEDER, do. DYBOVSKY 1879, do. KOMAROV 1908, do. PERFILJEV 1909, do. Aug. 17th 1920 HN No. 926; Lake Assabatch Aug. 15th 1925 MALAISE; Ustj Kamtchatka BEZAIS 1908.

Central Kamtchatka: Milkova BEZAIS 1908, do. PROTOPOPOF 1908; Shtchapina KOMAROV 1909; Tolbatchik BEZAIS 1908; the Chartchina mts. BEZAIS 1909; Klutchi BEZAIS 1909, do. AFANASEJEV 1909; Jelovka BEZAIS.

West and North Kamtchatka: Tigil LEVITZKY, do. GUDZENKO 1910.

»Kamtchatka»: STEWART, MERTENS (Hb. Berol.), KUSMISCHEFF, RIEDER.

In South Kamtchatka this plant was only seen in the above-enumerated localities. It flowers from July to September.

Most of the specimens agree well with MAXIMOVICZ's *δ pluricaule*, known from different parts of north-eastern Asia. Nos. 3100 and 3146 show slight traces of verticillation of the leaves.

Type of distribution: Eurasiatic.

Geographical area: The entire species: Europe: from central Scandinavia, southern Finland southwards to Spain and Caucasus. Asia: at Obi from about 62° N. lat., from Vilju and Kolyma distr. southwards to Asia Minor, Turkestan, Mongolia, Sze-ch'uan and southern Japan. Introduced into Eastern America.

The head form of this species does not seem to be represented in Asia.

Sedum Telephium L. *α.*

CHAMISSO in Linnaea VI (1831) p. 550; ERMAN, Verzeichn. p. 63. — *Sedum vulgare* LINK., LEDEB., Fl. Ross. II p. 180.

CHAMISSO reports this plant from Tigil as having been collected by ERMAN. I do not know to what species this report should be referred, perhaps to *S. verticillatum*.

465. ***Sedum verticillatum***[1] L., Sp. pl. ed. I (1753) p. 430 (excl. syn. RAJII).

PENNANT, Arct. Zool. (1784) p. CXV; GEORGI, Beschreib. III: 4 p. 981; DC., Prodr. III p. 402; BONGARD in Mém. Ac. Imp. Sc. St. Petersb. Sér. VI Sc. Nat. I (1835) p. 85 tab. 7; LEDEB., Fl. Ross. II p. 181; MAXIM. in Mél. Biol. XI (1883) p. 749. — »*Sedum foliis quaternis*» L., Amoen. Acad. II ed. 1 p. 352 Tab. 4, fig. 14 (Pl. Rar. Kamtsch. p. 19, fig. 14). — *Sedum Telephium* forma *verticillatum* FRÖDERSTRÖM in Meddel. Göteb. Bot. Trädg. I (1924) p. 30, fig. 1, 17, fig. 2, 1—3 et Tab. XII fig. 2—4.

South Kamtchatka: Upper Abshen R. noted by HN; near the mouth of Bolshaja R. noted by HN; lower Bolshaja R. noted by HN; W. of the mouth of Ipelka R. noted by HN; lower Danilina R. noted by HN; near Bolsheredsk Aug. 1847 VOSSNESENSKY; the mouth of Bystraja R. in Bolshaja R. noted by HN; Haikovaja village noted by HN; Apatcha KOMAROV 1908; shore of Bannaja R. RUBINSKI 1908; Nikolajevsk, Paratunka R. Aug. 11th 1920 HN No. 842; Savoiko KOMAROV 1908, do. July 6th 1920 HN No. 240.

East Kamtchatka: Petropavlovsk MERTENS; between Petropavlovsk and Avatcha volcano 250 m. noted by HN.

Central Kamtchatka: Kresti MALAISE 1926; Jelovka BEZAIS 1909.

»Kamtchatka»: STELLER acc. to LINNÆUS loc. cit. (type specimen of the species); MERTENS acc. to BONG. loc. cit.

In South Kamtchatka this plant is fairly common in the *Salix sachalinensis* thickets and *Filipendula* associations along the rivers, always on wet ground. It is the most common *Sedum* species there. It seems peculiar that this plant was not collected in the central part of the valley of the Kamtchatka river, where it might be expected to exist.

S. verticillatum has an erect growth and attains a height of about 1 metre. It was associated by FRÖDERSTRÖM loc. cit. with *S. Telephium*, from which in my opinion it differs somewhat. The leaves are petiolated, the lower sometimes having long petiolae. They are thin, often membranous, elliptic, broadest at the middle, tapering at both ends to points with a characteristic bowlike serrulation and covered with numerous translucent, colourless to brown-blackish resin-spots, which at a later stage of development seem partly to fall away. Further, it has very peculiar axillary bulblets, which in a later stage of development develop into long shoots. When the young plant is put in the press, these bulblets grow into strange chlorophyll-less, white, in a dry state brown, shoots which can be seen in the illustrations in LINNÆUS loc. cit. and BONGARD loc. cit., and were sometimes taken for inflorescences. The petals are greenish

[1] Determined by E. HULTÉN.

and seem to be narrower than in Scandinavian specimens of *S. Telephium*, and also the ripe pods are somewhat narrower; the verticillation of the leaves, although usually very prominent, seems to be a characteristic of minor taxonomic value. A good description, corresponding well to the Kamtchatka plant from which this species is discribed, is given by the eminent Russian botanist MAXIMOVICZ (loc. cit. p. 749). There, in my opinion on good grounds, he opposes the view expressed by BONGARD loc. cit. that LINNÆUS, misled by the incomplete specimens, had described a *S. purpureum* form as a new species.

It must be remembered that in Siberia the only *S. Telephium*-form seems to be of *purpureum* type, and that in Eastern Asia forms occur closely related to our species (for instance *S. viviparum* MAXIM., *S. angustum* MAXIM.). Possibly some closely related species of this type form a critical group in Eastern Asia.

Type of distribution: Asiatic Pacific.

Geographical area: Known with certainty from Kamtchatka, southern Kuriles, Yezo, Saghalin, Honshu, Sikoku, Kiushiu and China. Closely related forms *(S. viviparum, S. angustum)* in Corea, Ussuri prov., Kirin prov., Mukden prov. and in China.

Saxifragaceae DC.

Leptarrhena pyrolifolia (D. DON) R. BR.

SERINGE in DC., Prodr. IV p. 48; LEDEB., Fl. Ross. II p. 228 *(pyrolaefolia)*; ENGLER & PRANTL, Natürl. Pflanzenfam. III: 2 a p. 49; N. Amer. Fl. 22 : 2 (1905) p. 151; cfr. NEKRASOVA in Fl. As. Ross. 11 (1917) p. 8. — *Saxifraga pyrolifolia* D. DON in Transact. Linn. Soc. XIII: 2 (1822) p. 389. — *Saxifraga amplexifolia* STERNB., Rev. Saxifraga Suppl. 2 p. 42.

The source of the quotations of this plant from Kamtchatka is the report of DON who writes: »Habitat in Kamtschatka (MERK)». In Hb. Hort. Petrop. there exists a specimen of the plant labelled »E Kamtschatka ESCHSCHOLTZ». Even NEKRASOVA loc. cit. has stated that the plant does not occur in Asia. The reports are in all cases doubtful and require confirmation. The plant must probably be excluded from the flora of our area.

466. ***Saxifraga bracteata*** D. DON in Transact. Linn. Soc. XIII: 2 (1822) p. 367.

HULTÉN in Sv. Bot. Tidskr. 22 (1928) p. 225. — *Saxifraga rivularis* var. *Laurentiana* ENGLER & IRMSCHER in ENGLER, Pflanzenr. IV: 117 (Heft 67) p. 282 pro parte minore; ?YABE & YENDO, Fl. Shimushu p. (184); ?TAKEDA in Journ. Bot. 49 (1911) p. 114; ?KUDO, Fl. Paramush. p. 116. — *Saxifraga rivularis* FEDTSCH., Fl. Îl. Comm. p. 63; ENGLER & IRMSCH. in ENGLER, Pflanzenr. IV: 127 (Heft 67) p. 277 quoad pl. ex Insulis Command. — ?*Saxifraga exilis* YABE & YENDO, Fl. Shimushu p. (184) sec. TAKEDA.

Northern Kuriles: ?Paramushir M. AIZAWA 1900 and KUDO 1920 acc. to KUDO loc. cit.; ?Shumshu T. ISHIKAWA 1894 and K. YENDO 1903 acc. to YABE & YENDO loc. cit.

South Kamtchatka: »auf Starichkoff Insel und dem Vorgebirge Assatcha» RIEDER 1831; Toporkoff Island, Sarannaja Bay (= Starichkoff Island) Aug. 8th 1920 HN No. 804.

Commander Islands: Bering Island DYBOVSKY 1879, GREBNITZKY 1894 and acc. to FEDTSCH. loc. cit. STEJNEGER; Copper Island DYBOVSKY, GREBNITZKY and MOROZEWICZ, all acc. to FEDTSCH. loc. cit., »from the Governor 1887» sub *Chrysosplenium* (Hb. Acad. Petrop.).

»Kamtchatka»: PETERS (sub *S. rivularis* var. *Laurentiana*); collector unknown (Hb. Acad. Petrop. sub *S. rivularis*).

This rare plant I only saw once during my journeys in South Kamtchatka. It was growing abundantly on the N. W. slope of Toporkoff Island. The specimens had ripe seeds. From *S. rivularis* var. *Laurentiana* our plant differs in its high growth (10—13 cm.), large and carnose leaves with usually 7 broad rounded teeth, comparatively long-stipitated flowers, more rounded ovary, elliptical calyx-lobes, broadest at the middle, narrower at the base, and in possessing numerous bulblets at the base of the stem which grow into long runners. (Compare Pl. I, fig. a—c). My specimens are in a late state of development and the petals have withered, but according to N. Amer. Fl. 22: 2 (1905) p. 127 they are oval, while *S. rivularis* has oblong or cuneate petals. Within our area I never saw intermediate forms between this species and *S. rivularis*, which occurs there only in the quite characteristic var. *flexuosa*.

Saxifraga bracteata is apparently an extreme Pacific plant always occurring close to the sea.

As *S. rivularis* var. *Laurentiana* does not seem to occur within our area, and as ENGLER included plants belonging to our species under that name, I think that the reports of *S. rivularis* var. *Laurentiana* from the Kurile Islands should be referred to *S. bracteata*, as would indeed seem to be evident from the description of that plant given by TAKEDA loc. cit. The type specimen was collected by MERK »in Sibiria orientali», probably on Bering Island, which was visited by MERK, and on which the plant seems to be common.

Type of distribution: Northern Pacific.

Geographical area: Asia: (?)the Kurile Islands from Urup northwards (reported as *S. rivularis* var. *Laurentiana*), southern Kamtchatka, Commander Islands. America: the Aleutian Islands and the coast of Alaska.

467. ***Saxifraga bronchialis*** L., Sp. pl. ed. I (1753) p. 400.
subsp. ***Funstonii*** (SMALL) nov. comb.

Saxifraga cherlerioides D. DON in Transact. Linn. Soc. XIII (1822) p. 382; STERNB., Rev. Saxifraga Suppl. 2 p. 26 et tab. XIII; KOM., Voy. Kamtch. p. 452. — »*Saxifraga nova species*» CHAM. in Linnaea VI (1831) p. 555. — »*Saxifraga an nitida*» ERMAN, Verz. p. 63. — *Saxifraga nitida* LEDEB., Fl. Ross. II p. 207 quoad pl. Kamtsch. — *Saxifraga bronchialis* MERTENS, Bemerk. Fl. Koragins p. 64; HOOK. & ARNOTT in BEECHY's Voy. p. 114; LEDEB., Fl. Ross. II p. 207; ENGLER, Monogr. Saxifraga p. 215 (also var. *cherlerioides*); ENGLER & IRMSCH. in ENGLER, Pflanzenr.

IV: 117 (Heft 69) p. 458 (var. *α genuina* and *β cherlerioides* with f. *pseudo-burseriana*); FEDTSCH., Fl. Îl. Comm. p. 60 (var. *cherlerioides* and var. *congesta*); KUDO, Fl. Paramush. p. 117 (var. *cherlerioides* with f. *pseudo-burseriana*).

Northern Kuriles: Paramushir KUDO 1920 (var. *cherlerioides* f. *pseudo-burseriana* acc. to KUDO loc. cit.).

South Kamtchatka: Shadutka volcano 1125 m. Aug. 2nd 1921 HN No. 2587; Topik volcano 580 m. July 28th 1921 HN No. 2478 (ad var. *cherlerioides* vergens); Viljutchinskaja volcano 2000 m. Aug. 30th 1920 HN No. 1483 (P. T. NOVOGRABLENOF, var. *cherlerioides* f. *pseudo-burseriana*); Glinini Mts. RUBINSKI 1909 (var. *cherlerioides*); the mouth of Paratunka R. RUBINSKI 1908; between Lake Blichne and Lake Dalne KOMAROV 1908; Lake Dalne RAMENSKI 1909; Tarja Bay KOMAROV 1908 (var. *cherlerioides*); Mt. Trubi, Vilju R. KOMAROV 1908 (Hb. Berol., var. *cherlerioides* det. ENGL. & IRMSCH.); Lake Natchika, the eastern shore KOMAROV 1908, do. at the divide KOMAROV 1908; Nikolajevsk KOMAROV 1908; sources of Poperochnaja R. KOMAROV 1908 (Hb. Berol. var. *genuina* det. ENGL. & IRMSCH).

East Kamtchatka: Petropavlovsk (all var. *cherlerioides* f. *pseudo-burseriana*) July 1816 CHAMISSO (Hb. Berol.), do. ESCHSCHOLTZ (Hb. Berol.), do. STEWART, do. MERTENS, do. »Exp. LÜTKE», do. VOSSNESENSKY 1848, do. KOMAROV 1908, do. GUDZENKO 1910, do. July 4th 1920 HN No. 186, do. July 19th 1920 HN No. 507, do. June 14th 1921 HN No. 1709; Avatcha volcano PERFILJEF 1911 (var. *cherlerioides*), do. 900 m. Aug. 2nd 1920 HN No. 585 (ad var. *cherlerioides* vergens), do. 1300 m. Aug. 2nd 1920 HN No. 700 (var. *cherlerioides* f. *pseudo-burseriana*), do. 1000 m. Aug. 2nd 1920 HN No. 719 (ad var. *cherlerioides* vergens); Cape Shipunski DITMAR 1852 (sub *S. nitida* scripsit MAXIM.) (var. *cherlerioides*); mt. Krascheninnikof KOMAROV 1909 (var. *cherlerioides*); the Kronoki Pass KOMAROV 1909 (ad var. *vespertinam* vergens); Klutchevskaja volcano 3600 feet BEZAIS 1908 (var. *cherlerioides*), do. AFANASEJEV 1909, do. KOZLOVSKI 1909, do. KURTACHOF 1909 (also var. *cherlerioides*), do. Aug. 6th 1927 MALAISE No. 614; Ploskaja volcano (»pervaja na dolu sopotchka») PROTOPOPOF 1909; between Nishne-Kamtchatsk and Kamaki Aug. 1925 MALAISE No. 459; »Shivelutch ad ERMAN AD. v. CH. affinis *Saxifragae nitidae* St. p. 22 + 10 fig. 4» (Hb. Berol. det. ENGL. & IRM. var. *genuina* f. *typica*); the Chartchina mts. Aug. 12th 1927 MALAISE No. 615.

Commander Islands: Bering Island KJELLMAN (var. *cherlerioides*); DYBOVSKY 1879 (var. *cherlerioides*); Copper Island DYBOVSKY 1879 (var. *cherlerioides* and var. *congesta* acc. to FEDTSCH. loc. cit.), DOBROTVORSKY (var. *cherlerioides* acc. to FEDTSCH. loc. cit.), GREBNITZKY (var. *congesta* acc. to FEDTSCH. loc. cit.), MOROZEVICZ (var. *cherlerioides* and var. *congesta* acc. to FEDTSCH. loc. cit.).

Central Kamtchatka: Malka PROTOPOPOF 1909 (var. *cherlerioides*); Mt. Aak KOMAROV 1908 (var. *cherlerioides*); between Ganala and Pushtchina GRINOF 1909; Kamtchatka Vershina KOMAROV 1909, do. GRINOF 1909 (Hb. Berol. det. ENGL. & IRM. var. *genuina* f. *typica*); sources of Kashkan R. KOMAROV 1909

(var. *cherlerioides*); mt. Kunchekla PROTOPOPOF 1909 (also var. *cherlerioides*); Anauna R. Sept. 5th 1926 MALAISE Nos. 174 and 178, do. Aug. 19th 1926 MALAISE No. 172.

West and North Kamtchatka: Karaginsk Island MERTENS and POSTELS (var. *cherlerioides*).

»Kamtchatka»: »*S. pseudoburseriana* FISCH. Camtsch. MERK. Hb. PALLAS»; WILLD. Herb. No. 8432 (sub *S. densa* »Camtschatka in rupibus an *Saxifr. bryoides* (PALLAS)», later determined to *S. cherlerioides*); Hb. FISCHER, collector unknown (sub *Saxifraga* n. sp. Kamtchatka . . . *imbricata*) (var. *cherlerioides*); ESCHSCHOLTZ; CHAMISSO (sub »*Saxifraga* n. sp.») (var. *cherlerioides*); collector unknown »acc. a D. PRESCOTT 1831 Hb. MEYER» (var. *cherlerioides*); collector unknown (sub *Saxifraga Eschscholtzii*) (var. *cherlerioides*); collector unknown »FISCHER misit 1829» (sub *S. pseudo-burseriana*) (var. *cherlerioides*); »CHORIS FISCHER ded. 1821» (sub »*densa*») (var. *cherlerioides*); »*S. pseudo-burseriana* FISCH. Kamtschatka acc. a D. FISCHER 1835 Hb. MEYER»; KASTALSKY (Hb. Berol.); KUSMISCHEFF; RIEDER (all var. *cherlerioides*). Besides those enumerated above in Hb. Acad. Petrop. there is preserved a specimen labelled »*Saxifraga Stelleriana* MERK. Kamtschatka», which belongs to the form of the species common in the neighbourhood of Ochotsk and Ajan but not otherwise known from Kamtchatka. The plant was certainly not collected within our area and »Kamtchatka» in the label must be understood to mean the Kamtchatka province (compare HULTÉN, Fl. Kamtch. I p. 6).

In South Kamtchatka this plant occurs here and there in the alpine region, occasionally also in the lowlands. It seems to be more common in the eastern and central part. It flowers from the beginning of June to the middle of August.

subsp. ***spinulosa*** (ADAMS) nov. comb.

Saxifraga spinulosa ADAMS in Mém. Soc. Nat. Mosc. V (1817) p. 96.

West and North Kamtchatka: Pallan June 27th 1927 LONGINOFF.

S. bronchialis is a collective species that can be divided into several systematical units, which differ from each other in several, though usually not very marked, characteristics. It seems to me most rational to regard them as subspecies, as their geographical areas apparently are comparatively well marked off from one other. The species was described from Siberian specimens and the common Siberian form occurring from the Urals to Ochotsk southwards to Dahuria and Amur prov. might be regarded as its typical form, although there is a possibility that — as certain facts seem to indicate — the plant described by ENGLER & IRMSCHER as *a genuina* f. *picifolia* and occurring along the lower Yenisei and Lena is the plant of LINNAEUS. The first-mentioned plant is characterized by long, narrow, often subulate, rigid patent reddish leaves possessing a long stiff white mucronation and short regularly placed ciliae. The flowering stems are rigid, straight and long with the flowers gath-

ered close to the top, and are beset with leaves of about the same size in the upper and in the lower part. The petals are slightly cuneiform at the base and purple-spotted on their upper half. (Fig. 1 a, b. c).

Only one single specimen in the Kamtchatka-collections belongs to this type, viz. that from the northernmost locality: Pallan.



Fig. 1. *Saxifraga bronchialis.* a Shoot, b and c petals of subsp. *spinulosa* (Jakutsk distr., Kumach-Sur leg. N. H. NILSSON-EHLE); d leaves of subsp. *spinulosa* var. *Stelleriana* (Ajan, REGEL & TILING No. 121); e shoot, f and g petals of subsp. *austromontana* (Colorado, Larimer County PATTERSON No. 3140). The shoots and leaves enlarged 3: 1, the petals 6: 1.

This type was described by ADAMS in Mém. Soc. Nat. Mosc. V (1817) p. 96 as *S. spinulosa* and I therefore propose to call it *S. bronchialis* L. subsp. *spinulosa* (ADAMS) nov. comb.

The specimens of our species from central and southern Kamtchatka and America are, however, not identical with this type, although the differences are not very prominent. They have usually somewhat broader and shorter, not reddish, less patent and less rigid leaves with a shorter mucronation and somewhat less rigid and more irregular ciliae. The stems are usually more lax and curved and its lower leaves somewhat larger than the upper. Sometimes even the basal stem-leaves gradually pass into the upper. The flowers

are not gathered so close to the top of the stem, but the ramifications begin about half way up. Because of these characteristics, in which the Kamtchatka plant, as also the American plant, differs from the Siberian, I consider them more closely related to each other than to the latter. However in this »American» group at least two types are present. The first of them is found in the Rocky Mts. and is characterized by elliptical petals, completely claw-less and usually strongly purple-spotted in their upper half. It was described under the name *S. austromontana* by WIEGAND in Bull. Torr. Club. Vol. XXVII (1900) p. 389 and I propose the name *S. bronchialis* subsp. *austromontana*



Fig. 2. *Saxifraga bronchialis.* a, b Leaves, c petal of subsp. *Funstonii* (Disenchantment Bay F. FUNSTON No. 91); d shoot, e, f petals of subsp. *Funstonii* from Kamtchatka (MALAISE No. 614); g shoot, h, i petals of subsp. *Funstonii* var. *cherlerioides* (HN No. 700). The petals enlarged 6:1; a, b and d 3:1; g 5:1.

(WIEG.) nov. comb. for it. (Fig. 1 e, f, g). The second type, on the other hand, is found in Alaska (Lake Iliamna region M. W. GORMAN 1902 No. 22 Hb. Holm.) and Kamtchatka, and is characterized by elliptical, only yellow-spotted petals with a pronounced, although usually broad, claw. WIEGAND in the same paper p. 388 thought that it represented the typical Asiatic form of the plant (which he had not seen) and he thus called it *S. bronchialis* L. Later however this type was described by SMALL in N. Amer. Fl. 22 (1905) p. 154 under the name *Leptasea Funstonii*, of which I have seen a co-type specimen in Hb. Berol., and I therefore propose to call it *S. bronchialis* subsp. *Funstonii* (SMALL)

nov. comb. (Fig. 2, a—f). Plants of all these three above-mentioned types here taken as subspecies are by ENGLER & IRMSCHER enumerated under *S. bronchialis α genuina.*

Several specimens in Kamtchatka, however, differ from typical subsp. *Funstonii* in a lower growth and in having the root-leaves curved and gathered into rounded clusters. This type was described from specimens collected by MERK in Kamtchatka (probably at Petropavlovsk) as *S. cherlerioides* and is usually regarded as a variety of *S. bronchialis.* I propose to call it *S. bronchialis* subsp. *Funstonii* var. *cherlerioides* (fig. 2 g—i). There is no strict line of demarcation between it and typical subsp. *Funstonii*, intermediate forms sometimes being found. (The indications of this variety in the above enumeration are approximate, as not all the specimens were available at the time of the final revision and as the limit is quite diffuse.) Its most highly differentiated forms, characterized by low growth, often nearly spherical shoots with almost mucroless leaves, was designated as *S. pseudo-burseriana* by FISCHER and is by ENGLER & IRMSCHER regarded as a form of var. *cherlerioides.* It has yellow-spotted petals with shorter claw than the common form. Sometimes the petals are practically clawless. In Kamtchatka it seems to occur only around Petropavlovsk.

S. bronchialis var. *cherlerioides* as classed by ENGLER & IRMSCHER is in my opinion hardly uniform. For instance, they include in it, besides the Kamtchatka plant, that from Ochotsk and Ajan, which however differs, *inter alia*, in having leaves with a characteristic, broad, comparatively long, white mucro, to be found also on the upper stem-leaves and so characteristic that from a single leaf the plant can be distinguished from all Kamtchatka forms. This plant was named *S. Stelleriana* by MERK and described by SERINGE in DC., Prodr. IV p. 46. I propose to call it *S. bronchialis* subsp. *spinulosa* var. *Stelleriana* (MERK ex SERINGE) nov. comb. (fig. 1 d), as it seems to me that it stands in the same relation to subsp. *spinulosa* as var. *cherlerioides* does to subsp. *Funstonii.* I have seen too little material to be able to judge whether the American var. *vespertina* (SMALL) ENGL. & IRMSCH. is analogously related to subsp. *austromontana*, which seems probable. I have seen one specimen from Kamtchatka — that from the Kronoki Pass — which strongly resembles var. *vespertina*, but it is perhaps not advisable to express any opinion as to its relationship on the strength of a single specimen only.

Besides the type discussed above there are certainly still some others that are found within the collective species *S. bronchialis.*

Type of distribution: The whole species: Asiatic, transgressing into Western America. Subsp. *spinulosa:* Asiatic. Subsp. *austromontana:* Western American. Subsp. *Funstonii:* Northern Pacific.

Geographical area: Subsp. *spinulosa:* from the Urals at least to northernmost Kamtchatka, southwards in the Urals to 55° N. lat., to ?Northern Mongolia, Dahuria and Amur prov. Subsp. *Funstonii:* Asia: at least in Kamtchatka, the northern Kuriles and on Commander Islands. America: the coast

of Alaska and the adjacent islands. Subsp. *austromontana:* British Columbia to Alberta, southwards to Utah and New Mexico.

468. ***Saxifraga cernua*** L., Sp. pl. ed. I (1753) p. 403.

Ledeb., Fl. Ross. II p. 219; Engler, Monogr. Saxifraga p. 106; Engler & Irmsch. in Engler, Pflanzenr. IV: 117 (Heft 67) p. 270.

Central Kamtchatka: Sources of Kashkan R. (Pushtchina) Komarov 1909.

»Kamtchatka»: Tilesius acc. to Ledeb. loc. cit., Bogdanowitsch 1895 (Hb. Hort. Petrop.).

The specimens belong to *f. simplicissima* Ledeb.

Type of distribution: Circumpolar, arctic-alpine.

Geographical area: Europe: from Iceland, Spitzbergen, Franz Josef's Land and Nova Zembla southwards in the mts. to Scotland, central Scandinavia, Kola, northern Russia and the Urals (to about 61° N. lat.), also in the Alps and the Carpathians. Asia: along the North Coast to Chukch Penins. and in the mts. of Altai, Turkestan, Himalaya southwards to Ladak and Sikkim, Transbaikalia, Ochotsk and northern China; one locality known in Japan and one in Kamtchatka. America: along the north coast of Alaska to Ellesmereland and northern Labrador, also in the Rocky Mts. southwards to New Mexico. W., E. and N. Greenland.

469. ***Saxifraga davurica*** Willd., Sp. pl. II (1799) p. 645.

Engler, Monogr. Saxifraga p. 147; Engler & Irmsch. in Engler, Pflanzenr. IV: 117 (Heft 67, 69) p. 21 et 655 (excl. f. *calycina* and pl. ex Penins. Kamtsch.). — *Saxifraga Redowskyana* Sternb., Rev. Saxifraga Suppl. 2 p. 44.

South Kamtchatka: Between Gorelaja volcano and Assatcha 800 m. July 30th 1922 Hn No. 4058; Gorelaja Volcano 800 m. July 22nd 1922 Hn No. 3980.

West and North Kamtchatka: The pass between Sedanka and Jelovka (Krasni sopka) July 16th 1909 Bezais No. 332 (Hb. Holm.).

»Kamtchatka»: Chamisso acc. to Sternberg and Engler loc. cit.

This plant, which is apparently rare in Kamtchatka, differs from *S. unalaschkensis* in its filiform or slightly triangular filaments, evenly tapering towards the apex, follicles with thin beaks, scapes with scattered short glands and petals with longer claws. The leaves have short, stout glands in the margin and sometimes also on the surface. All specimens that I have seen from our area have more or less reddish petals. Perhaps they represent a special geographical race of this comparatively variable species, but the material available is too small to allow of any opinion being formed on this question.

Compare Johnson in Minnesota Stud. Pl. Sc. (1923) p. 13 and Pl. IV.

Type of distribution: Eastern Asiatic—Western American.

Geographical area: Asia: Cho-Kondo Mts., Transbaikalia (Turcz.), Ajan, between Jakutsk and Ochotsk, Ochotsk, Penshina Bay, Kamtchatka, Konyam

Bay, Chukch Penins. The specimen from Wrangel Island reported by ENGLER & IRMSCH. under *S. davurica* belongs to *S. unalaschkensis*. Compare under that species. America: from Bering Straits to Point Barrow.

470. ***Saxifraga flagellaris*** WILLD. ex STERNB., Rev. Saxifraga (1810) p. 25 t. 6 (non vidi).

?*Saxifraga prorepens* FISCH. in STERNB., Rev. Saxifraga Suppl. 2 p. 18.

East Kamtchatka: Klutchevskaja Volcano 4900 feet July 15th 1909 KOZLOVSKI, do. Aug. 5th 1927 MALAISE No. 617.

Central Kamtchatka: The Pass to Anauna R. Aug. 18th 1926 MALAISE No. 177.

All these specimens were flowering. They belong to subsp. *euflagellaris* var. *platysepala* and are one- to two-flowered.

Type of distribution: Circumpolar, arctic-alpine.

Geographical area: (Subsp. *euflagellaris*) Europe: Spitzbergen, Nova Zembla, Caucasus. Asia: along the coast at least from Taimyr R. eastwards to Lena, Chukch Penins., Altai, Sajan Mts., Transbaikalia, Tannu-ola, Alatau, western Tibet, Kashmir, Sikkim, and Kamtchatka. America: from Alaska over the Arctic Archipelago to Hudson Bay, southwards in the Rocky Mts. to New Mexico and Arizona. N. Greenland (southwards to about 76° N. lat.). In Kashmir and Sikkim also subsp. *mucronulata*, in Sze-ch'uan and Yunnan subsp. *megistantha* HANDEL-MAZZ.

471. ***Saxifraga foliolosa*** R. BR., Chlor. Melvill. (1823) p. 17.

Saxifraga stellaris var. *comosa* RETZ., MAXIM., Manuscr. (»Collect Fl. Kamtsch.»).

East Kamtchatka: Klutchevskaja volcano, the central valley 1550 m. July 24th 1927 (flowering) P. T. NOVOGRABLENOF (Hb. Holm.).

»Kamtchatka»: Collector unknown »Kamtschatka PALLAS in Hb. Ac.» acc. to MAXIM. loc. cit.

This plant, usually taken as a variety of *S. stellaris*, seems to be a distinct species. The radical leaves are smaller than in that species. The scapes are high, erect, rigid and practically glabrous, the inflorescence very patent with broader bracts. The claws of the petals are longer than in *S. stellaris* and the sepals not always reflexed. All flowers except the terminal (sometimes the terminal on each branch) are replaced by bulblets. It has a more northern distribution than *S. stellaris*. A description and discussion of the geographical area is given by LINSBAUER in Österr. Bot. Zeitschr. LXIII (1913) p. 481.

Type of distribution: Circumpolar, arctic-alpine.

Geographical area: Europe: from Spitzbergen, Franz Josef's Land and Nova Zembla southwards to northern Scandinavia and Kola Penins., also in central Norway, the Alps and the Pyrenees. Asia: along the North Coast to Chukch Penins., Sajan Mts., between Jakutsk and Ochotsk, Kamtchatka. America: from Alaska (57° N. lat.) to Ellesmereland and Labrador southwards

to Colorado (40° N. lat.) (acc. to FERNALD 1925) and Maine (46° N. lat.). W. Greenland southwards to between 66° and 64° N. lat. E. Greenland southwards to between 70° and 67° N. lat. acc. to OSTENFELD.

472. ***Saxifraga fusca*** MAXIM. in Mél. Biol. VIII (1872) p. 602 et in Bull. Acad. St. Petersb. XVIII (1873) p. 38.

TAKEDA in Journ. Bot. 49 (1911) p. 111. — *Saxifraga purpurascens* KOMAROV in FEDDE, Rep. Spec. Nov. XIII (1914) p. 167. — *Saxifraga punctata* var. *typica* f. *purpurascens* ENGLER & IRMSCH. in ENGLER, Pflanzenr. IV: 117 (Heft 67) p. 10.

Northern Kuriles: Paramushir acc. to TAKEDA loc. cit.

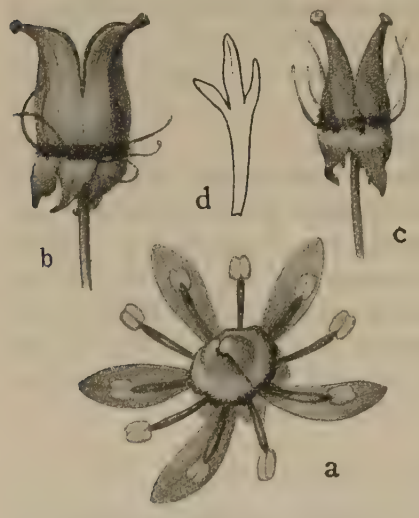


Fig. 3. *Saxifraga fusca*. a flower (HN. No. 4055); b, c carpels in different stage of development (b MALAISE No. 620, c Gremushej R. KOMAROV); d bract. All enlarged 5 : 1.

South Kamtchatka: Shadutka volcano 1125 m. Aug. 2nd 1921 HN. No. 2604; Mutnovskaja volcano 1400 m. July 29th 1922 HN. No. 4055.

East Kamtchatka: Avatcha volcano 1000 m. Aug. 3rd 1920 HN. No. 720, do. Mt. Saraj PERFILJEF 1911 (sub *S. purpurascens*); Klutchevskaja volcano 3600 feet BEZAIS 1908 (Hb. Berol. sub *S. punctata* var. *typica* f. *purpurascens* (KOM.) ENGL. & IRMSCH.), do. 4900 feet KOZLOVSKI (sub *S. purpurascens*), do. »the northern slope» AFANASEJEV 1909 (sub *S. purpurascens*), do. Aug. 5th 1927 MALAISE No. 619; Ploskaja volcano PROTOPOPOF 1909 (sub *S. purpurascens*); »Kosyrevsk, pervaja na dolu sopotchka» PROTOPOPOF 1909 (sub *S. purpurascens*); the Chartchina Mts. Aug. 12th 1927 MALAISE No. 629.

Central Kamtchatka: Gremushej R. (Korjatskaja) KOMAROV 1908; Korjatskaja volcano Aug. 13th 1928 W. EYERDAM.

This plant is rare in South Kamtchatka, where it seems to exist only on lava-rocks in the high peaks. Its first flowers burst early, probably in the middle of June, as all specimens collected were in full anthesis or in fruit. It is a very characteristic Japanese species, well described and figured by JOHNSON in Amer. Journ. Bot. XIV (1927) p. 324 Pl. XLVI and XLVII, in which he takes it as the type for a separate sub-section »*Radiflorae*» of the section *Hydatica*. The following observations may be made on the description there given: The filaments are not so clavate as in his Pl. XLVI, but nearly filiform; the petals are usually one-nerved, but sometimes 1—2 faint side-branches can be traced. The bracts are entire or three-lobed, rarely pectinate as in JOHNSON's Pl. XLVII. Compare also fig. 3. In the whole »*punctata*»-group it is necessary only to compare carpels of plants in the same state of development, as they change form very considerably during the development

of the plant. A characteristic feature of our species is that they are small and very compressed when young, the large somewhat undulated or lobated disc then being very prominent (fig. 3 a). During the anthesis they rise gradually (a comparatively young stage see fig. 3 c) and afterwards become comparatively large, with short, distinctly outward-curved styles (fig. 3 b).

Our plant differs somewhat in its inflorescence from the Honshu plant and belongs to var. *divaricata* (Franch. & Sav., Enumer. Pl. Jap. II p. 354), which acc. to Takeda loc. cit. is the only form of the species on Yezo and the Kuriles. Besides the above-enumerated specimens two others were collected on Cape Lopatka (Hn. No. 43 June 19th 1920 and Hn. No. 125 June 22nd 1920), which possibly belong to *S. fusca* but differ in having more capituliform inflorescence, larger flowers, larger and stouter ovaries and light-red petals. Judging from their habitus one might suppose that they were hybrids between our species and *S. punctata*, but the pollen is good. They are in bud and I prefer not to express a definite opinion on them.

Type of distribution: Asiatic Pacific.

Geographical area: Kamtchatka, the Kuriles, Yezo and Honshu, to the north var. *divaricata*.

473. ***Saxifraga hieracifolia*** Waldst. & Kit., Pl. rar. hung. I (1802) p. 17.

Engler & Irmsch. in Engler, Pflanzenr. IV: 117 (Heft 67) p. 24.

South Kamtchatka: Mt. Dogchinag (Golygina R.) Rubinski 1909; Grishkinoj R. (Lake Natchika) Komarov 1909.

East Kamtchatka: The Kronoki Pass Komarov 1909 (Hb. Berol.).

Central Kamtchatka: Gremushej R. (Korjatskaja volcano) Komarov 1908; Ganalski Vystraki, the Pass Korjaka-Vachtal July 19th 1924 P. T. Novograblenof; sources of Kashkan R. (Pushtchina) Komarov 1909 (Hb. Holm.).

West and North Kamtchatka: Kachtana R. (Tigil) Levitsky; the foot of »Krasnaja Sopka» (Tigil) Rieder 1831.

The specimens belong to var. *typica* Engl. & Irmsch. The species is apparently rare in Kamtchatka.

Type of distribution: Circumpolar, arctic-alpine.

Geographical area: Europe: Spitzbergen, Nova Zembla, Kolgujef, some few localities in Kola, northernmost and central Norway, central France, the Alps, the Carpathians and the northern Urals. Asia: along the North Coast to Chukch Peninsula, southwards to Vilju distr., Gishiga and Kamtchatka, also in Altai, Sajan Mts., around Lake Baikal and in northern Mongolia. America: St. Matthew's Island, Hall Island, along the north coast of Alaska and Victoria Land to Baffin Land. E. Greenland from Scoresby Sound to about 74° N. lat. Var. *Rydbergii* in the Rocky Mts. (Montana).

474. ***Saxifraga hirculus*** L., Sp. pl. ed. I (1753) p. 402.

Ledeb., Fl. Ross. II p. 210; Engler, Monogr. Saxifraga p. 122; Fedtsch., Fl. Îl. Comm. p. 61; Engler & Irmsch. in Engler, Pflanzenr. IV: 117 (Heft 67) p. 110.

Commander Islands: Copper Island Stejneger acc. to Fedtsch. loc. cit.

Central Kamtchatka: The pass to Anauna R. Aug. 18th 1926 Malaise No. 175 and 176.

»Kamtchatka»: »Kamtschatka dt. am. Tilesius Petrop. 17» (Hb. Ledeb.), »Ledeb. Camtchatca» (Hb. Trautv.).

The specimen Malaise No. 175 is quite typical, but Malaise No. 176 is a very doubtful low-grown form (about 2 cm. high) without petals, which seems nevertheless to belong to this species.

Type of distribution: Circumpolar, arctic-alpine.

Geographical area: Europe: from Iceland, Spitzbergen and Nova Zembla southwards scattered on peat-bogs and in the mts. to England, eastern France, the Alps, the Carpathians and Caucasus. Asia: along the North Coast to Chukch Peninsula, southwards in the mts. to Armenia, Kashmir, Tian-shan, Transbaikalia, Jakutsk distr., northern Kamtchatka and Commander Islands. America: from the north coast of Alaska and Ellesmereland southwards along the coast to British Columbia, in the mts. to Colorado and to Hudson Bay. W. Greenland (between 76° and 80° N. lat. acc. to Ostenf.). E. Greenland (between 72° and 76° N. lat. acc. to Ostenf.). In Sze-ch'uan the closely related *S. montana* H. Smith.

475. ***Saxifraga Merkii*** Fisch. in Sternb., Rev. Saxifraga Suppl. I (1822) p. 1 et tab. 1.

Cham. in Linnaea VI (1831) p. 556; Erman, Verzeichn. p. 63; Ledeb., Fl. Ross. II p. 208; Engler, Monogr. Saxifraga p. 208; Miyabe, Fl. Kuril. Isl. p. 233; Yabe & Yendo, Fl. Shimushu p. (184) (var. *Idzuroei*); Kom., Voy. Kamtch. pp. 87, 212, 344, 452; Kudo, Fl. Paramush. p. 116.

Northern Kuriles: Paramushir Kraschenninikof about 1740 (compare Kudo, Fl. Paramush. p. 24), Matsubara 1915, Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: N.W. of Kurile Lake 1050 m. noted by Hn; western slope of Sholtovskaja volcano 600 m. Aug. 22nd 1922 Hn No. 4372; Mt. Dogchinag (Golygina) Rubinski 1909; Cape Piratkof Rieder 1831; Assatcha Mts. 1125 m. noted by Hn; Akhomten Bay Aug. 30th 1920 Hn No. 1160 (Malaise), do. 250 m. Sept. 11th 1920 Hn No. 1308; Mutnovskaja volcano 800 m. July 28th 1922 Hn No. 4046; Gorelaja volcano 900 m. July 20th 1922 Hn No. 3967; Opala volcano 1100 m. July 21st 1921 Hn No. 2286; Lake Tolmachovaja 600 m. July 13th 1922 Hn No. 3908; Seljdovaja pad R. (Tarja Bay) Komarov 1908; Shalsan R. (Mt. Saraj) Komarov 1908; the Shalsan Pass 700 m. Sept. 1st 1921 Hn No. 2984 e; Mt. Tshemushka, Natchika Komarov 1908; Mt. Shtchapotchka (Natchika) Komarov 1908; sources of Poperochnaja R. Komarov 1908; Mt. Palovinaja Aug. 1st 1928 W. Eyerdam.

East Kamtchatka: Avatcha volcano 675 m. July 30th 1920 Hn. No. 609, do. about 2000 m. noted by Hn; the foot of Kichpinitch volcano Komarov 1909; Mt. Krasheninnikof Komarov 1909; Uzon Komarov 1909; the Kronoki Pass Komarov 1909; Klutchevskaja volcano 3500 feet Kozlovski 1909 (Hb. Berol.), do. Aug. 6th 1927 Malaise No. 618; Shivelutch 4000 feet »Ad Erman Ad. v. Ch.» (Hb. Berol.).

Central Kamtchatka: Gremushej R. Komarov 1908; sources of Kashkan R. Komarov 1909; Anauna R. Aug. 19th 1926 Malaise No. 171.



Fig. 4. *Saxifraga Merkii.* Photograph from Gorelaja volcano, Kamtchatka.

West and North Kamtchatka: Mt. Krasni Sopka between Sedanka and Jelovka Bezais 1909.

»Kamtchatka»: Kegel, Peters 1831, Rieder 1831.

In South Kamtchatka this peculiar plant (fig. 4) is fairly common in the alpine region. It often grows on half-flowing mud and is one of the plants that best stand the conditions on the volcanic cones where, whenever it rains, the volcanic ashes flow down as small mud-streams covering and destroying all vegetation. On Avatcha volcano a small group of our species was found growing on the volcanic cone about 700 m. above the altitude where otherwise the vegetation had ceased. It also grows on lava-streams together with only two other plants, viz. *Oxyria digyna* and *Cardamine bellidifolia.* It

flowers from the beginning of July to the end of the period of vegetation in the middle of September.

It occurs in a low-grown (3—4 cm.) and single- or few-flowered form, but often attains a height of about a decimetre, with branched scape (var. *robusta* Takeda in Journ. Bot. 49 (1911) p. 113). The leaves are usually entire, but sometimes the occurrence of a large gland-like projection on one side of the apex or of one large denticulation on each side in some of the leaves shows that transition-forms between it and var. *Idzuroei* exist.

Type of distribution: Eastern Asiatic..

Geographical area: Known from Jablonoi Mts., Kolyma, Kamtchatka, the Kuriles, Yezo and (var. *Idzuroei*) Honshu.

Saxifraga neglecta Bray.

Sternb., Rev. Saxifraga Suppl. 2 p. 36.

Sternberg reports Chamisso as collector of this species (= *S. nudicaulis* Don) in Kamtchatka. Otherwise it is not known from our area.

476. ***Saxifraga nivalis*** L., Sp. pl. ed. I (1753) p. 401.

Engler, Monogr. Saxifraga p. 145; Engler & Irmsch. in Engler, Pflanzenr. IV: 117 (Heft 67) p. 29; Smith in Norrl. Handbibl. IX (1920) p. 200. — *Saxifraga pauciflora* Sternb., Rev. Saxifraga Suppl. I p. 6 et Suppl. 2 p. 46; Cham. in Linnaea VI (1831) p. 556; Ledeb., Fl. Ross. II p. 217.

South Kamtchatka: »Bei Hadutka und auf der Lopatka» Rieder 1831; Cape Kutcha (Tarja Bay) Komarov 1908; Mt. Tshokatch (Natchika) Komarov 1908.

East Kamtchatka: Petropavlovsk Chamisso 1816 (Hb. Berol. sub *S. pauciflora*), do. Mt. Signalski June 1st 1921 Hn. No. 1598.

Kamtchatka specimens of this species are low-grown and of a somewhat peculiar type. They were described by Sternberg as *S. pauciflora* and it is possible that they represent a separate type. The material enumerated above is, however, too small to allow of any opinion being formed as to its variation, as nearly every collection consists of only one or two plants.

The species apparently occurs very scattered within our area.

Type of distribution: Circumpolar, arctic-alpine.

Geographical area: Europe: from Iceland, Spitzbergen and Nova Zembla southwards in the mts. to Ireland, England, central Scandinavia, Karelia Ladogensis and Perm prov., also in the Sudetes. Asia: along the North Coast to Chukch Penins., also in Dahuria and Kamtchatka. America: Unalashka, St. Lawrence Island, along the North Coast to Northern Labrador and in the Arctic Archipelago to Ellesmereland. W., E. and N. Greenland.

477. ***Saxifraga oppositifolia*** L., Sp. pl. ed. I (1753) p. 402.

subsp. ***asiatica*** (Hayek) Engler & Irmsch. in Engler, Pflanzenr. IV: 117 (Heft 69) p. 640.

?*Saxifraga biflora* MERTENS, Bemerk., Fl. Koragins p. 64. — *Saxifraga oppositifolia* FEDTSCH., Fl. Îl. Comm. p. 60.

South Kamtchatka: Mt. »Krasni gor» (Natchika) KOMAROV 1908.

East Kamtchatka: Cape Kamtchatka P. T. NOVOGRABLENOF acc. to MALAISE in letter.

Commander Islands: Copper Island MOROZEVICZ acc. to FEDTSCH. loc. cit.

West and North Kamtchatka: ?Karaginsk Island acc. to MERTENS loc. cit.

This plant is apparently very rare in Kamtchatka.

Type of distribution: The entire species: Circumpolar, arctic-alpine.
subsp. *asiatica:* ?

Geographical area: the entire species in many forms in Europe from Iceland, Spitzbergen, Franz Josef's Land and Nova Zembla southwards in the mts. to Scotland, Ireland, Spain, Italy and the Carpathians. Asia: along the North Coast to Chukch Penins., southwards in the mts. to Tomsk prov., Kansk distr., Sajan Mts., Kashmir, northern Mongolia, Ajan and Kamtchatka. America: from the north coast of Alaska to Ellesmereland and Labrador, southwards to Montana (47° N. lat. acc. to FERNALD) (to Wyoming acc. to RYDB.), and Vermont (44° N. lat.). W., E. and N. Greenland.

Subsp. *asiatica:* in the mts. of Central Asia, Ajan and Kamtchatka.

478. ***Saxifraga punctata*** L., Sp. pl. ed. I (1753) p. 401.

HOOK. & ARNOTT in Beechy's Voy. p. 114; LEDEB., Fl. Ross II p. 215; KOIDZ., Pl. Yokoyam. p. 211; ENGLER, Monogr. Saxifraga p. 137 (also var. *Nelsoniana*); FEDTSCH., Fl. Îl. Comm. p. 62; ENGLER & IRMSCH. in ENGLER, Pflanzenr. IV: 117 (Heft 67) p. 9 (*α typica* f. *corymbosa*, f. *coarctata*, excl. f. *purpurascens* et *β arguta* quoad pl. Kamtsch.); YABE & YENDO, Fl. Shimushu p. (184); KUDO, Fl. Paramush. p. 116. — »*Saxifraga foliis reniformibus . . .*» GMEL., Fl. Sib. IV p. 161. — »*Saxifraga Geum*(?)» MERTENS, Bemerk. Fl. Koragins p. 63. — *Saxifraga gracilis* CHAM. in Linnaea VI (1831) p. 554. — *Saxifraga Nelsoniana* JOHNSON in Minn. Stud. Pl. Sc. (1923) pp. 14, 78.

Northern Kuriles: Paramushir: C. TARO 1892, MATSUBARA 1915, KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Upper Kidipalok R. Sept. 4th 1922 HN. No. 4472; upper Unkanakchek R. Aug. 20th 1922 HN. No. 4332; Mt. Dogchinag RUBINSKI 1909 (subsp. *Nelsoniana*); Assatcha Mts. at the sources of Opala R. July 31st 1922 HN. No. 4091 (subsp. *Nelsoniana*); Akhomten Bay 500 m. Sept. 11th 1920 HN. No. 1370, do. Sept. 22nd 1920 HN. No. 1456; Mutnovskaja volcano 1200 m. July 29th 1922 HN. No. 4057 (subsp. *Nelsoniana*); Opala volcano 400 m. July 25th 1921 HN. No. 2425; Bolsheredsk BEZAIS 1909, do. RUBINSKI 1909, do. June 13th 1922 HN. No. 3789 (subsp. *Nelsoniana*); Mt. Zaikin Mys (Paratunka) KOMAROV 1908; Paratunka KOMAROV 1908; Bogatyrjovka July 16th 1920 HN. No. 466 a (typical); E. of Lake Natchika KOMAROV 1908; Shalsan R. KOMAROV 1908; Ozdets R. KOMAROV 1908; Mt. Shtchapotchka

Komarov 1908; Mt. Palovinaja (Savoiko) 800 m. July 8th 1920 Hn. No. 313, do. 600 m. July 8th 1920 Hn. No. 331; Savoiko July 7th 1920 Hn. No. 253 (typical); Poperochnaja R. Savitch 1909; Topolovaja R. Komarov 1909; Savoiko July 17th 1928 W. Eyerdam; Avatcha Bay acc. to Hook. & Arnott loc. cit.

East Kamtchatka: Sierroglaska Rubinski 1908; Petropavlovsk Yokoyama acc. to Koidz. loc. cit., do. Perfiljef 1911; Kalashtyrka valley Komarov 1909 (f. *coarctata* Hb. Berol.); between Petropavlovsk and Savoiko July 5th 1920 Hn. No. 204 (typical); between Petropavlovsk and Avatcha volcano 250 m. Aug. 21st 1920 Hn. No. 986 (typical), do. 200 m. June 24th 1921 Hn. No. 1793 a and b (subsp. *Nelsoniana*); Avatcha volcano 675 m. Aug. 4th 1920 Hn. No. 725 (typical); the northern foot of Kichpinitch volcano Komarov 1909 (var. *typica* Hb. Berol.); the Kronoki Pass Komarov 1909; Klutchevskaja volcano 360 feet Bezais 1908, do. Aug. 6th 1927 Malaise; Ustj-Kamtchatsk July 1925 Malaise No. 462.

Commander Islands: Bering Island Kjellman, Dybovsky, Grebnitsky, and acc. to Fedtsch. loc. cit. Stejneger; Copper Island Dybovsky, acc. to Fedtsch. loc. cit. Tilman, Stejneger, Grebnitzky and Morozevicz, acc. to Johnson loc. cit. Sept. 3rd 1891 Macoun and Aug. 7th 1895 Stejneger No. 53 (»Commander Islands»).

Central Kamtchatka: The Malka Pass Komarov 1909; Gremushej R. Komarov 1908 (»var. *typica* f. *gracilis*» Hb. Berol.); Ganala Komarov 1909; the sources of Kashkan R. Komarov 1909 (var. *typica* f. *corymbosa* Hb. Berol.).

West and North Kamtchatka: Between Jelovka and Sedanka Bezais 1909; the mouth of Tigil R. Bezais 1909; 6 verst S.W. of Pallan Savtchenko 1911; Karaginsk Island acc. to Mertens loc. cit.

»Kamtchatka»: Eschscholtz, Chamisso (Hb. Berol.), Kegel, Stewart, Kastalsky (»var. *typica* f. *gracilis*» Hb. Berol.), Peters, Rieder 1831, collector unknown »*S. gracilis* Sternb. in juniori statu Det. Sternb.» Hb. Acad. Petrop., collector unknown »*S. semidecandra* Wormsk. Kamtschatka Fischer misit 1829» (Hb. Berol. »var. *typica* f. *gracilis*»).

In South Kamtchatka this species is fairly common in the lowlands as well as in the mountains. It flowers from the beginning of June to the end of September.

In the material enumerated above at least 3 genotypically different types are included. I am not, however, able to find any definite line of demarcation between these types on studying the materials now available to me from our area and from neighbouring countries. This might be possible if a larger and more representative collection were avilable, although at present it seems most probable that the different types pass gradually into each other. Some of the plants have comparatively elongated, cymose inflorescence with thin, sometimes practically capillary branches, small flowers, follicles (in young state) with long, comparatively thin, straight beaks, small stigmas and not very

prominent disc. The mature capsules have strongly outward-curved beaks. Such plants usually have the branches of the inflorescence hairy from short-stalked scattered distinctly capitate glands. They correspond closely to the form occurring in northern Siberia and might be regarded as typical *S. punctata*. The most pronounced specimens belonging to this group in the collection available to me at the final revision are marked »(typical)» in the above enumeration.

Some of the specimens, on the other hand, have more contracted, sometimes rather capitate inflorescence with thick, rigid, patent branches, larger flowers, young follicles with shorter, thicker beaks, large flattened stigmas and a thick swollen disc. The mature capsules have thicker beaks, not so pronouncedly outward-curved. Those specimens usually have the branches of the inflorescence densely hairy from long articulated hairs ending with or without a head. They agree with the American plant called *S. Nelsoniana*, which JOHNSON, who loc. cit. p. 8—16 gives a detailed review of the American forms of the section »*Hydatica*», takes as a species. *S. tuberosa* described and illustrated by STERNBERG loc. cit. is probably this plant. The most typical specimens belonging to this group in the collection now at hand are marked »(subsp. *Nelsoniana*)» in the enumeration. Even if the plant appears to be distinct in America, I do not think it is possible to regard it as a distinct species in Kamtchatka, and I propose to call it *S. punctata* L. subsp. *Nelsoniana* (D. DON) nov. comb. This might possibly be due to a hybridization with other forms occurring there but not present in America. It should be pointed out that the classification of this group would need access to large material, as only follicles in the same state of development can be compared with each other.

Both the above-mentioned types have clavate filaments. However, a very gracile plant (HN Nos. 1370, 4232, 4472 and the plant from Klutchevskaja collected by MALAISE), closely related to the typical form but with filiform filaments and longer and denser hairiness, was also collected. As the material is too poor I only mention it here as a form which, after examination of a larger amount of material, may prove to be a separate type. It strongly recalls *S. aestivalis* FISCH. & MEY. from N. W. America, of which I have seen only one specimen.

Type of distribution: The whole species: Asiatic—Western American. Subsp. *Nelsoniana:* Northern Pacific.

Geographical area: The type: from the Urals along the North Coast at least to Kolyma and Kamtchatka, in the mts. southwards to Northern Mongolia, Corea, Ussuri and Honshu. Subsp. *Nelsoniana:* Asia: from the north coast of Easternmost Asia (Wrangel Island, Chukch Peninsula) to Kamtchatka and the northern Kuriles. America: from the north coast of Alaska (to the mouth of Mackenzie R.) southwards to British Columbia. Subsp. *aestivalis* (= *S. aestivalis* FISCH. & MEY.): America: the south coast of Alaska at least from Kodiak Island eastwards to Western Montana, southwards to Idaho and Oregon, also reported from Coronation Gulf by MACOUN & HOLM. In America the closely

related species *S. arguta* D. Don, which seems to be distinct, from Washington to Montana, southwards to California and New Mexico. (The American distributions acc. to Johnson loc. cit.).

479. ***Saxifraga rivularis*** L., Sp. Pl. ed. I (1753) p. 404.

var. ***flexuosa*** (Sternb.) Engler & Irmsch. in Engler, Pflanzenr. IV: 117 (Heft 67) p. 282.

[*Saxifraga flexuosa* Sternb., Rev. Saxifraga Suppl. II (1831) p. 38 tab. XV (non vidi)]. — *Saxifraga rivularis* Mertens, Bemerk. Fl. Koragins p. 63; Ledeb., Fl. Ross. II p. 221 quoad pl. Kamtsch., Engler, Monogr. Saxifraga p. 104 (quoad pl. Kamtsch.); Engler & Irmsch. in Engler, Pflanzenr. IV: 117 (Heft 67) p. 277 (quoad pl. Kamtsch. excl. pl. ex Ins. Commander).

South Kamtchatka: Assatcha Mts. at the sources of Opala R. 500 m. July 31st 1922 Hn No. 4099; Akhomten Bay Sept. 22nd 1920 Hn No. 1430 and 1463; Grishkinoj R. (Lake Natchika) Komarov 1908; Palovinaja R. (Savoiko) Savitch 1908.

East Kamtchatka: the foot of Kishpinitch volcano Komarov 1909; the Kronoki Pass Komarov 1909 (Hb. Berol.); Klutchevskaja volcano Aug. 6th 1927 Malaise; Lake Assabatch Aug. 1925 Malaise No. 460 and 461.

Central Kamtchatka: the sources of Kashkan R. Komarov 1909; Anauna R. Sept. 5th 1926 Malaise No. 173.

West and North Kamtchatka: Karaginsk Island acc. to Mertens loc. cit.

»Kamtchatka»: Ledebour loc. cit. reported the plant from Kamtchatka as collected by Redowsky, who never visited our area.

In South Kamtchatka this plant is rare. It seems to be more common northwards. It flowers from July to September.

All Kamtchatka specimens belong to var. *flexuosa*, which is known from Chukch Penins. and Alaska. A specimen from Selkirk Mts. in Hb. Holm. also belongs to this type. The conditions within *S. rivularis* thus seem to be similar to those within *S. bronchialis* and *S. punctata*, as all three species are apparently represented in Eastern Asia and Western America by a Northern Pacific race. To judge from the var. *flexuosa* material I have seen, the claw on the petals is somewhat more pronounced than in the typical form. If this characteristic holds good the plant might be regarded as a subspecies of *S. rivularis*.

Type of distribution: The whole species: Circumpolar. Var. *flexuosa:* Northern Pacific.

Geographical area: The whole species: Europe: from Iceland, Spitzbergen, Franz Josef's Land and Nova Zembla southwards to northern Scotland, central Scandinavia and Kola penins. Asia: along the North Coast to Chukch Penins., in Kamtchatka, on the northern and southern Kuriles. America: from the north coast of Alaska, Ellesmereland (82° N. lat.) and Labrador southwards

to Wyoming (43° N. lat.) and New Hampshire (44° N. lat.). W., E. and N. Greenland (to 83° N. lat. acc. to FERNALD). To var. *flexuosa* belong plants from the Kurile Islands (?), Kamtchatka, Chukch Penins., Alaska (at least on the southern coast) and Selkirk Mts. (at least in part).

Saxifraga scapigera FISCH.

STERNB., Rev. Saxifraga Suppl. 2 p. 18.

STERNBERG reports this species from Kamtchatka without mentioning the collector. He adds that he has seen a picture of it, which FISCHER gave him. I do not know with certainty which plant he had in mind; possibly it was *S. serpyllifolia*. I have not seen STERNBERGS Rev. Saxifraga in which he mentions this species on p. 54.

480. ***Saxifraga serpyllifolia*** PURSH, Fl. Amer. sept. I (1814) p. 310.

FEDTSCH., Fl. Îl. Comm. p. 61; ENGLER & IRMSCH. in ENGLER, Pflanzenr. IV: 117 (Heft 69) p. 659.

South Kamtchatka: Mt. »Krasni gor» (E. of Lake Natchika) KOMAROV 1908 (Hb. Berol.).

East Kamtchatka: Klutchevskaja volcano BEZAIS 1908, do. KOZLOVSKI 1909, do. Aug. 5th 1927 MALAISE No. 621.

Commander Islands: Copper Island DYBOVSKY 1879, acc. to FEDTSCH. loc. cit. STEJNEGER, GREBNITZKY and MOROZEVICZ, Aug. 26th 1921 SANDBERG (Hb. Holm.).

West and North Kamtchatka: Karaginsk MERTENS.

»Kamtchatka»: »Auf d. Kamtsch. Gebirgskette» RIEDER 1831.

The species occurs in different forms and it seems probable that it could be divided into geographical races after an examination of more extensive material.

Type of distribution: Asiatic—Western American.

Geographical Area: Asia: Known from Tajmyr R., Cape Cheljuskin, Preobrashenie Island, Chukch Penins., Kamtchatka and Commander Islands (var. *viscosa* TRAUTV. in Altai). America: St. Lawrence Island, Pribilof Islands, Unalashka. *S. alaskana* SMALL from the north coast of Alaska seems to be very closely related.

Saxifraga Sieversiana STERNB., Rev. Saxifraga Suppl. 2 (1831) p. 16.

ENGLER, Monogr. Saxifraga p. 140; ENGLER in ENGLER & PRANTL. Nat. Pfl. fam. III: 2 a p. 57. — *Saxifraga sibirica* GEORGI, Beschreib. III: 4 p. 965. — *Saxifraga bimaculata* LEDEB., Fl. Ross. II p. 220.

The specimens on which the report of this plant from Kamtchatka is based were collected by REDOWSKY, who died before reaching the Peninsula.

The species must be excluded from the flora of our area.

481. ***Saxifraga unalaschkensis*** STERNB., Rev. Saxifraga Suppl. 2 (1831) p. 9 tab. 21 (*unalaschensis*).

A. GRAY in Proc. U. S. Nat. Mus. VII (1884) p. 527. — *Saxifraga davurica* FEDTSCH., Fl. Îl. Comm. p. 62; ENGLER & IRMSCH. in ENGLER, Pflanzenr. IV: 117 (Heft 69) p. 655 quoad pl. Kamtsch. et quoad f. *calycinam* sec. spec. in Hb. Berol.

South Kamtchatka: Grishkinoj R. (Lake Natchika) KOMAROV 1908 (Hb. Berol. sub *S. davurica* f. *Willdenowii*).

East Kamtchatka: the Kronoki Pass KOMAROV 1909 (sub *S. davurica*); Klutchevskaja volcano BEZAIS 1908 (sub *S. davurica*), do. KOZLOVSKI 1909 (sub *S. davurica*), do. Aug. 6th 1927 MALAISE No. 616.

Commander Islands: Copper Island STEJNEGER and MOROZEVICZ acc. to FEDTSCH. loc. cit.

Central Kamtchatka: Kunchekla PROTOPOPOF 1909 (sub *S. davurica*); Klutchi AFANASEJEV 1909 (sub *S. davurica*).

This characteristic species differs from *S. davurica* in its clavate filaments (not subulate, as stated by ENGLER & IRMSCH. p. 34), stout follicles with thick beaks, glandular-villous (in later state almost glabrous) scapes, and petals with shorter claws. The leaves are (sometimes only slightly) glandular-villous in the margin but have no such short-stipitated stout glands as *S. davurica*. *S. unalaschkensis* is certainly more closely related to *S. Lyallii* ENGLER than to *S. davurica*. As the plant from Copper Island was reported by A. GRAY as *S. unalaschkensis* it undoubtedly belongs to our species. Compare JOHNSON in Minnesota Stud. Pl. Sc. (1923) p. 15 and Pl. IV.

ENGLER & IRMSCH. loc. cit. did not quite realize the difference between this species and *S. davurica*. Thus, the plants reported by them as *S. davurica* f. *calycina* (= *S. calycina* STERNB., Suppl. II p. 10 tab. XXI) belong to our species, as is clearly seen from the glandular-villous hairs on peduncles, scapes and leaves, as well as on the clavate filaments and stout follicles. Further, the plant reported from Konyam Bay by KJELLMAN as *S. davurica* f. *genuina* belongs to *S. unalaschkensis* while his *S. davurica* f. *gracilis* is a typical *S. davurica*. Our species may — like *S. davurica* — have white or red petals and greenish or reddish follicles. All Kamtchatka specimens I have seen have white petals.

Type of distribution: Northern Pacific.

Geographical area: Asia: Wrangel Island, Konyam Bay, Chukch Penins., S. E. Kamtchatka Penins., Commander Islands. America: the Aleutian Islands, Alaska Peninsula, Shumagin Islands, Pribilof Islands, St. Matthew's Island, Hall Island.

Heuchera.

»*Heuchera* Hort. Cliff. 82 Gron. virg. 27.» L., Amoen. Acad. II ed. I p. 337 (Pl. Rar. Kamtsch. p. 5). — *Heuchera americana* PENNANT, Arct. Zool. (1784) p. CXV; GEORGI, Beschreib., III: 4 p. 830. — *Heuchera caulescens* PURSH, Fl. bor. amer. I p. 188; DC., Prodr. IV p. 52, cfr. TORREY & GRAY, Fl. N. Amer. I p. 578. — *Heuchera divaricata* DC., Prodr. IV p. 52. — Cfr. LEDEB., Fl. Ross. II p. 230.

The reports of *H. americana* by PENNANT and GEORGI at any rate are due to the quotation of LINNAEUS loc. cit., where he mentions this plant in the list of those occurring both in Kamtchatka and Canada. It was probably based on a specimen collected by STELLER in America. Whether the reports of *H. caulescens* and *H. divaricata* are attempts at a better interpretation of that specimen, or whether they are independent erroneous reports, it is difficult to say. Even LEDEBOUR had realized that no *Heuchera* species exists in Asia. The genus must be excluded from the flora of our area.

Tiarella trifoliata L.

PENNANT, Arct. Zool. (1784) p. CXV; GEORGI, Beschreib. III: 4 p. 266; cfr. LEDEB., Fl. Ross. II p. 229. — »*Mitella foliis ternatis*» L., Amoen. Acad. II ed. I p. 351 (Pl. Rar. Kamtsch. p. 18).

All the above reports of this plant from Kamtchatka are apparently due to the report of LINNAEUS, probably based on a specimen collected by STELLER at cape »St. Eliae» in America. The species must be excluded from the flora of our area.

482. ***Chrysosplenium alternifolium*** L., Sp. pl. ed. I (1753) p. 398.

GEORGI, Beschreib. III: 4 p. 961; LEDEB., Fl. Ross. II p. 226; FRANCHET in Nouv. Arch. Mus. Paris Sér. 3, Bull. 2 (1890) p. 106; FEDTSCH., Fl. Îl. Comm. p. 63; NEKRASOVA in Fl. As. Ross. Vyp. 7 (1915) p. 22. — »*Chrysosplenium foliis alternis*» GMEL., Fl. Sib. III p. 29.

South Kamtchatka: Sarannaja R. RIEDER (sub *C. camtschaticum*); Agashka R. noted by HN; Bolsheredsk ZELENIN 1909, do. July 8th 1921 HN No. 2057, do. July 10th 1921 HN No. 2071, do. June 13th 1922 HN No. 3786; Haikovaja village June 9th 1922 HN No. 3781; about Apatcha May 25th 1849 VOSSNESENSKY; between Nikolajevsk and Shutor KOMAROV 1908 (Hb. Berol.); Natchika RUBINSKI 1909; Savoiko KOMAROV 1909, do. July 6th 1920 HN No. 228.

East Kamtchatka: Nishne Kamtchatsk BEZAIS 1908; Ustj Kamtchatsk June 25th 1925 MALAISE No. 464.

Commander Islands: Copper Island STEJNEGER acc. to FEDTSCH. loc. cit.

Central Kamtchatka: The Malka Pass KOMAROV 1909; Kamtchatka vershina KOMAROV 1909; Svetloj klutch R. May 26th 1925 MALAISE No 463; Kresti PROTOPOPOF 1909.

West and North Kamtchatka: Tigil BEZAIS 1909; Pallan SAVTCHENKO 1911.

»Kamtchatka»: ESCHSCHOLTZ (mixed with *C. kamtschaticum* in Hb. Hort. Petrop.), RIEDER.

All specimens that allowed of the number of stamens being checked proved to have eight. I saw no typical subsp. *tetrandrum* among the material.

Type of distribution: ?Eurasiatic, transgressing into Western America.

Geographical area (including subsp. *tetrandrum*): Europe: from Spitzbergen and Nova Zembla southwards to France, northern Italy, northern Balkans, and southern Russia. Asia: from the North Coast southwards to Altai, northern Mongolia, northern China and Honshu, also in Sikkim. America: the north coast of Alaska and the Arctic Archipelago to Ellesmereland, southwards (probably rare) in the Rocky Mts. to Colorado. In America and in arctic countries subsp. *tetrandrum*. A map of the distribution is given by NEKRASOVA loc. cit. (unnumbered map at the end of the paper). The plant is not known from Greenland (although marked in the map of NEKRASOVA as existing there), nor from Iceland.

483. ***Chrysosplenium Beringianum*** ROSE in Bot. Gaz. 23 (1897) p. 275.

East Kamtchatka: Klutchevskaja volcano Aug. 5th 1927 MALAISE No. 622.

This interesting plant was collected in a sterile spot near melting snow at the highest point reached by MALAISE. In its thick rootstock, thickish leaves with ciliated, in their lower part dilatated, petioles, its few shining seeds and prominent lobated disc, this species differs strongly from *C. alternifolium* and is easily recognizable. The petals are said to be four, »purplish or becoming so». In the Kamtchatka specimens they are often five and greenish with purplish spots. The plant is illustrated in JORDAN, The Fur Seals and Fur-Seal Islands of the northern Pacific Ocean III (1899) p. CXI (MACOUN's paper on the plants from the Pribilof Islands). It was not previously known from Asia.

Type of distribution: Northern Pacific.

Geographical area: Asia: East Kamtchatka. America: seems to be known with certainty only from St. Paul's Island and from »Alaska». In N. Amer. Fl. 22: 2 p. 84 the distribution is given as »Islands of Bering Sea and coast of Alaska».

484. ***Chrysosplenium kamtschaticum*** FISCH. ap. DC., Prodr. IV (1830) p. 48.

HOOK. & ARNOTT in Beechy's Voy. p. 114; LEDEB., Fl. Ross. II p. 227; MAXIM. in Mél. Biol. IX (1877) p. 765; FRANCHET in Nouv. Arch. Mus. Paris Sér. 3, Bull. 3 (1891) p. 15 pl. 2 fig. C; YABE & YENDO, Fl. Shimushu p. (184); FEDTSCH., Fl. Îl. Comm. p. 63; NEKRASOVA in Fl. As. Ross. Vyp. 7 (1915) p. 43; KUDO, Fl. Paramush p. 117. — *Chrysosplenium oppositifolium* CHAM. in Linnaea VI (1831) p. 557.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Lower Ozernaja R. noted by HN; upper Ksudach R. noted in *Filipendula* thickets by HN; sources of Opala R. near Assatcha noted by HN; upper Udoshk R. noted in *Filipendula* thickets by HN; Agashka R. noted by HN; the mouth of Bystraja R. in Bolshaja R. noted in A. 54,

do. on old mud-banks noted by Hn; Mt. »Gorachie Gora» Komarov 1908; Mt. »Zaikin Mys» Komarov 1908; Paratunka at the hot springs Komarov 1908; Mt. Kishtchik (Tarja Bay) Komarov 1908; Sarannaja Bay Rieder 1831 pro parte; Ozdets R. Komarov 1908; Mt. Palovinaja 400 m. (Savoiko) July 8th 1920 Hn No. 336 a; Avatcha Bay acc. to Hook. & Arnott loc. cit.

East Kamtchatka: Petropavlovsk Mertens, do. Wright, do. Komarov 1908, do. July 17th 1920 Hn No. 486, do. July 21st 1920 Hn No. 536, do. June 6th 1921 Hn No. 1644; the Kalashtyrka valley Komarov 1909; between Petropavlovsk and Avatcha vólcano 250 m. Aug. 21st 1920 Hn No. 985 a; do. June 24th 1921 Hn No. 1812.

Commander Islands: Copper Island Grebnitzky, Stejneger and Morozevicz all acc. to Fedtsch. loc. cit.

»Kamtchatka»: Collector unknown (probably Steller) Hb. Pallas (Hb. Berol.), Langsdorff (Hb. Berol.), Eschscholtz sub. *C. »integrifolia* mihi» C. A. Mey. in Hb. Acad. Petrop., Mertens, »Kastalsky Hb. Cham.», Rieder 1833.

Noted in the following association:

In *Salix sachalinensis—Filipendula—Geum* ass.;
Scattered (A. 54).

In South Kamtchatka this plant is common in *Filipendula kamtschatica* thickets, near rivulets and on old mud-banks by the rivers. It flowers in June and July.

Type of distribution: Asiatic Pacific.

Geographical area: Copper Island, Southern Kamtchatka, the Kuriles, Saghalin, Yezo and northern Honshu. The report from Chukch Penins. based on a specimen collected by Chamisso, acc. to the label at St. Lawrence Bay, seems to be doubtful. A map of the distribution (too far to the north in Kamtchatka) is given by Nekrasova loc. cit. (unnumbered map at the end of the paper).

Chrysoplenium ramosum Maxim.

Yabe & Yendo, Fl. Shimushu p. (184).

This species is reported as collected by Yendo on Shumshu 1903. Without access to the specimen it is impossible to say if the specimen should be referred to that species or to *C. rimosum.*

485. ***Chrysosplenium rimosum*** Kom. in Fedde, Rep. Spec. Nov. XIII (1914) p. 168.

East Kamtchatka: The Kronoki Pass 4000 feet Komarov 1909.

This species in only known with certainty from the type locality where only two or three specimens were collected. They are flowering or have young capsules containing seeds which are not ripe. This must be regretted as the sculpture of the seeds is a very important characteristic in the genus

Chrysosplenium. The seeds are described in the original diagnosis thus: »semina opaca, ovalia rimosa, rimis anastomosantibus». This description, however, is certainly based on immature seeds. The best developed seem to be quite smooth without any fissures but with traces of a characteristic carina. In this respect, as in most others, the type specimen of *C. rimosum* agrees with a very doubtful plant collected by MALAISE on Aug. 19th 1926 at Anauna R. in the Central Mountains (MALAISE No. 170). This plant has ripe seeds, which are illustrated in fig. 5. They are smooth and have a characteristic carina, which, however, is present also in the seeds of those species which are closest related to it viz. *C. glechomaefolium* NUTT. and *C. ramosum* MAXIM. (although the illustration of the seeds of those species in FRANCHET's monograph of the genus does not show such a carina). Habitually it differs considerably from the type specimens of *C. rimosum*, as can be seen from the illustration of the two plants Pl. I, fig. d., e. The most pronounced differences are its strict, erect growth, strong ramification, and more carnose leaves. In the details, however, both plants differ in the same way from *C. glechomaefolium* and *C. ramosum*. From *C. glechomaefolium* they differ in having light-brown seeds only half as large as the black shiny seeds of that species. Every capsule contains numerous seeds (about 40) while the capsules of *C. glechomaefolium* contain only some few. Their leaves are more weakly serrulated. In the original diagnosis *C. rimosum* is said to be completely glabrous, but a minute investigation shows that some few brownish viscose hairs are present in the upper axilles. The same is the case with MALAISE No. 170. In this characteristic both the specimens resemble the more glabrous forms of *C. ramosum*, from which they differ in small seeds, larger flowers and more deeply cleft (not practically truncate) capsules. A peculiarity of our specimens is that the petioles of the lower, opposite leaves are adnate in their lower part to the branches they support. Although both plants are so different as regards habitus they thus show such close agreement that it would not be advisable to refer them to different species. As only a sheet of each is known, no idea of their variation can be obtained and I must therefore leave the specimens of MALAISE without a definite determination, hoping that more material of this interesting type will be collected, with the aid of which the question can be settled.



Fig. 5. Seeds of *Chrysosplenium* cfr. *rimosum* (MALAISE No. 170) Natural size 0.6 mm.

Type of distribution: ?

Geographical area: Known only from our area.

Chrysosplenium nudicaule BUNGE.

MAXIM. in Mél. Biol. IX (1877) p. 759.

MAXIMOVICZ reports this species from Kamtchatka from a specimen in hb. FISCHER. *C. nudicaule*, which is a Central Asiatic plant, must certainly be excluded from the flora of our area.

Chrysosplenium Wrightii FRANCH. & SAV., Enumer. Pl. Jap. II (1879) p. 356 in obs.

FRANCH. in Nouv. Arch. Mus. Paris Sér. 3, Bull. 2 (1890) p. 108; NEKRASOVA in Fl. As. Ross. Vyp. 7 (1915) p. 22.

It is very doubtful whence the single known specimen of this plant collected by WRIGHT originates. In the original diagnosis the locality is said to be »Ochotsk sea». In the monograph of the genus FRANCHET gives it as »Kamtschatka, ad Ochotsk» and, lastly, NEKRASOVA in her monograph of the Russian Asiatic *Chrysosplenium* forms gives it as »on the west coast of Kamtchatka» and — certainly without grounds — marks it in the map with a small red circle in the neighbourhood of Kompakovaja on the west coast of the Kamtchatka Peninsula. The route of the expedition of RODGERS and RINGOLD which WRIGHT followed is very little known (compare Fern Bull. 9, 1901 p. 53—54) and the plant might as well have been collected on Saghalin, Yezo or the Kuriles. Until otherwise confirmed the species must be excluded from the flora of our area.

Parnassia Laxmanni PALL. ex SCHULTES, Syst. Veg. VI (1820) p. 696.

LEDEB., Fl. Ross. I p. 264; Cfr. REGEL, Pl. Radd. Dicotyl. Polypet. No. 270 in Bull. Mosc. 34: 2 (1861) p. 507 et RADDE, Reisen I: 2 p. 261.

In the original description this plant is reported from Kamtchatka. This report is repeated by LEDEBOUR. Even REGEL realized that the report was incorrect. The plant should be excluded from the flora of our area.

486. ***Parnassia palustris*** L., Sp. pl. ed. I (1753) p. 273.

CHAM. in Linnaea VI (1831) p. 589; ERMAN, Verzeichn. p. 62; LEDEB., Fl. Ross. I p. 262 (*β multiseta*); REGEL, Pl. Radd. Dicotyl. Polypet. No. 269 in Bull. Mosc. 34: 2 (1861) p. 504 et RADDE, Reisen I: 2 p. 259; YABE & YENDO, Fl. Shimushu p. (184); FEDTSCH., Fl. Îl. Comm. p. 44; KOIDZ., Pl. Yokoyam. p. 211; NEKRASOVA in Fl. As. Ross. Vyp. 11 (1917) p. 20; KUDO, Fl. Paramush. p. 118. — *Parnassia multiseta* (LEDEB.) FERNALD in Rhodora 28 (1926) p. 211.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka collected by kosacks (Hb. Petrop.); lower Ozernaja R. Aug. 12th 1921 HN No. 2833; Utashut island RIEDER 1833; near Sahach volcano noted in A. 192; middle Ksudach R. noted in A. 87; the divide between Ksudach and Shadutka R. Aug. 4th 1921 HN No. 2631; the hot spring at Shadutka volcano Aug. 12th 1922 HN No. 4240; Akhomten Bay Sept. 10th 1920 HN No. 1234; Opala volcano 400 m. July 25th 1921 HN No. 2424; the hot springs at Bannaja R. 440 m. Sept. 12th 1921 HN No. 3212; Bogatyrjovka PERFILJEF 1910, do. July 16th 1920 HN No. 467; Toporkof Island (Sarannaja Bay) Aug. 8th 1920 HN No. 802, do. Aug. 15th 1920 HN No. 907; Grishkinoj R. KOMAROV 1908; Lake Natchika KOMAROV 1908; Mt. Zerkalo, Natchika KOMAROV 1908; Savoiko Aug. 3rd 1928 W. EYERDAM.

East Kamtchatka: The entrance of Avatcha Bay PERFILJEF 1911 (Hb. Berol.); Petropavlovsk MERTENS; between Petropavlovsk and Avatcha volcano

noted by Hn; Avatcha volcano 450 m. Aug. 5th 1920 Hn No. 749; the Kronoki Pass Komarov 1909; between Shtchapina and Kronoki Komarov 1909; Klutchevskaja volcano Kurtashof 1909, do. 3000 feet Bezais 1909; Ustj-Kamtchatsk Aug. 7th 1926 Malaise No. 169.

Commander Islands: Bering Island Kjellman, Dybovsky 1879, Grebnitzky 1894, acc. to Fedtsch. loc. cit. Stejneger, acc. to Koidz. loc. cit. Yokoyama; Copper Island Dobrotvorsky acc. to Fedtsch. loc. cit., Gudzenko 1910.

Central Kamtchatka: Malka Protopopof 1908, do. Komarov 1909; Lake Ovalni, Korjatskaja Komarov 1908; Gremushej R. Komarov 1908; Mashura Komarov 1909; Shtchapina Komarov 1909; Kunchekla Grinop 1909; Tolbatchik Komarov 1909, do. Grinop 1909; Anauna R. Aug. 19th 1926 Malaise No. 167 and 168; Klutchi Afanasejev 1909, do. Bezais 1909.

West and North Kamtchatka: Kishtchik Rubinski 1908.

»Kamtchatka»: Rastargujeff, Kastalsky, Stewart, Mertens, Rieder »Rieder Kamtsch. ad Erman Ad. v. Ch.» (Hb. Berol. var. *multiseta* det. Ledeb.), »Kamtschatka Fischer misit 1829» (ex Hb. Kunth) (Hb. Berol).

Noted in the following association:
In *Carex—Sanguisorba*—Moss ass.:
Single (A. 87); Sparse (A. 192).

In South Kamtchatka this plant is fairly common in the wet meadows. It flowers in August and the beginning of September.

Wahlenberg in Fl. Lapp. p. 74 described a variety, var. *tenuis* which, as far as I can see, very much approaches to the type which Fernald gave the name *P. multiseta*. In Kamtchatka at least, it is hardly possible to separate this specifically from the head-form. The most pronounced var. *tenuis* in my collection is Hn No. 1234.

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland, northernmost Scandinavia and Vaigatch southwards to Spain, northern Italy, northern Balkans, Caucasus and southern Russia. Asia: along the North Coast to Chukch Penins., southwards to Asia Minor, northern Persia, the Himalayas, northern China and Formosa; in the northern part of the area var. *tenuis* is the most common form. America: from the mouth of Mackenzie R. to Labrador (58° N. lat.) southwards to California (38° N. lat.), Wyoming, Minnesota, Michigan and Newfoundland (51° N. lat.). Also in N. Africa.

The distribution is given by Nekrasova on the third map in her paper. The species is not known from Nova Zembla, which country is included in its area on that map.

Ribes alpinum L.

Pennant, Arct. Zool. (1784) p. CXV; Pallas, Fl. Ross. I: 2 p. 36; Georgi, Beschreib. III: 4 p. 797; Ledeb., Fl. Ross. II p. 196; Maxim. in Mél. Biol. IX (1873) p. 238. — »*Ribes inerme, floribus planiusculis* . . .» Gmel., Fl. Sib. III p. 173.

All these quotations of *R. alpinum* from Kamtchatka are founded on GMELIN's report of »*Ribes inerme, floribus planiusculis* . . .» interpreted as *R. alpinum*. This interpretation is certainly incorrect, at any rate as far as the Kamtchatka plant is concerned, and the species must be excluded from the flora of our area.

Ribes dikuscha FISCH.

JANCZEWSKI, Monogr. Gross. in Mém. Soc. Phys. Hist. Nat. Genève 35 (1905—07) p. 344.

This species is reported by JANCZEWSKI loc. cit. from »Kamtchatka». Whether by that he means the Kamtchatka Province or Kamtchatka Peninsula I do not know, nor on what specimen the report was founded. The report needs confirmation.

Ribes grossularia L.

PENNANT, Arct. Zool. (1784) p. CXV; GEORGI, Beschreib. III: 4 p. 799; LANGSDORFF, Bemerk. II p. 231; KOM., Voy. Kamtsch. p. 17.

This species is cultivated at Petropavlovsk.

487. ***Ribes latifolium*** JANCZ. in Bull. Acad. Cracovie (1906) p. 4.

?»*Ribes vulgaris fructu rubro*» KRASCHENINN., Kamtsch. p. 101. — ?*Ribes rubrum* PENNANT, Arct. Zool. (1784) p. CXV; ?GEORGI, Beschreib. III: 4 p. 796; ?LEDEB., Fl. Ross. II p. 199 quoad pl. Kamtsch. pro parte. — *Ribes petraeum* KOM., Voy. Kamtsch. p. 454.

South Kamtchatka: Middle Karymchina R. noted by HN; Danilina R. 100 m. July 14th 1921 HN No. 2147; 10 km. E. of Haikovaja noted by HN; between the hot springs at Siku R. and Apatcha July 5th 1922 HN No. 3845; 4 km. E. of Apatcha at the ford Aug. 31st 1921 HN No. 2983; Avatcha village KOMAROV 1908; »Svetloj klutch R.» Avatcha R. KOMAROV 1908; between Savoiko and Korjaka KOMAROV 1908 (Hb. Berol.); 5 verst S. of Korjaka RUBINSKI 1908.

This plant appears here and there in the river-valleys of South Kamtchatka. In 1922 the first flowers of the season were noted on June 20th and by July 3rd the plant had ceased flowering. Its large and very palatable fruits ripen at the end of August and the beginning of September.

The species is closely related to *R. petraeum*, from which it differs in its more narrow, somewhat denticulate sepals, ovary with the top more prominent above the disc, shorter and more few-flowered racemes and pubescent year-shoots. *R. latifolium* may be said to be the Pacific representative of *R. petraeum*. Cfr. JANCZEWSKI, Monogr. Gross. in Mém. Soc. Phys. Hist. Nat. Genève 35 (1905—07) p. 294.

Type of distribution: Asiatic Pacific.

Geographical area: Southern Kamtchatka, the Kuriles, Saghalin, Yezo, eastern Manchuria and northern China.

Ribes rubrum L.

CHAM. in Linnaea VI (1831) p. 568; ERMAN, Verzeichn. p. 110; LEDEB., Fl. Ross. II p. 199 quoad pl. Kamtsch. saltem pro parte; MAXIM. in Mél. Biol. IX (1873) p. 233.

All the above reports of this species from Kamtchatka are founded on a specimen in Hb. Acad. Petrop., acc. to the label collected by ERMAN in »Flussthälern des Westrandes von Kamtschatka». It has not the prominent five-lobated disc of *R. triste* and thus cannot, like the other *Ribes*-specimens from northern Kamtchatka, belong to that species. It was referred by JANCZEWSKI to *R. rubrum*. As even CHAMISSO loc. cit. mentions (»Specimen mancum identitatem speciei vix evincens»), the specimen is incomplete and does not warrant a closer determination. I merely mention it here as an observation for the botanical collectors in northern and western Kamtchatka. The report needs confirmation.

488. ***Ribes triste*** PALLAS in Nova Acta Acad. Sc. Petrop. X (1797) p. 378.

KOM., Voy. Kamtsch. p. 454. — *Ribes* DITMAR, Reisen I p. 564.

East Kamtchatka: Klutchi BEZAIS 1908 (Hb. Berol.), do. AFANASEJEV 1909, do. PROTOPOPOF 1909, do. June 2nd 1921 HN No. 3310; Klutchevski mts. PROTOPOPOF 1909.

Central Kamtchatka: Mashura PROTOPOPOF 1908, do. KOMAROV 1909; Kirganik KOMAROV 1909; Tolbatchik KOMAROV 1909.

West and North Kamtchatka: Tigil LEVITZKY 1848, do. BEZAIS 1909.

The species seems to have a northern distribution within our area.

Type of distribution: American, transgressing into eastern Asia.

Geographical area: Asia: at least from Boganida R. eastwards to Chukch Penins. southwards to Manchuria, Saghalin, northern Yezo and central Kamtchatka. America: from Alaska to Newfoundland, southwards to Oregon, South Dakota and Vermont.

Platanaceae LINDL.

Platanus orientalis L.

LANGSDORFF, Bemerk. II p. 231.

It is difficult to understand the reason for LANGSDORFF's curious report of this species from Kamtchatka. The plant should be excluded from the flora of our area.

Rosaceae JUSS.

489. ***Spiraea Beauverdiana*** SCHNEIDER in Bull. Herb. Boiss. Ser. 2: 5 (1905) p. 348 (var. *typica*, var. *Steveni*).

SCHNEIDER, Ill. Handb. Laubholzk. I p. 478. — *Spiraea betulifolia* auct., non PALL.; CHAM. & SCHLECHT. in Linnaea VI (1831) p. 589; ERMAN, Verzeichn. p. 64; KITTLITZ, Denkw. II p. 258; LEDEB., Fl. Ross. I, p. 14; MAXIM. in Acta Horti Petrop. VI (1879) p. 207 quoad pl. ex Asia orientali; KOIDZ., Pl. Yokoyam. p. 212; SCHNEIDER in Bull. Herb. Boiss. Ser. II: 5 (1905) p. 348; SCHNEIDER, Ill. Handb.

Laubholzkunde I p. 478; Kom., Voy. Kamtch. pp. 20, 40, 56, 412, 454 et Fl. Penins. Kamtsch. I p. 331; Kudo, Fl. Paramush. p. 118 (var. *Aemiliana*); Hultén, Fl. Kamtch. I p. 26. — *Spiraea chamaedryfolia* Cham. & Schlecht. in Linnaea II (1827) p. 2 cfr. Linnaea VI (1831) p. 589; Hook. & Arnott in Beechy's Voy. p. 113. — *Spiraea Steveni* Rydb. in N. Amer. Fl. 22: 3 (1908) p. 247.

Northern Kuriles: Paramushir T. Matsubara 1915, Kudo 1920.

South Kamtchatka; Kurile Lake noted by Hn; sources of Kidipalok R. noted by Hn; upper Unkanakchek R. noted in A. 204; Mt. Dogchinag (»60 km. from the mouth of Golygina R.») Rubinski 1909; N. of Golygina village noted by Hn; W. of Shádutka volcano noted by Hn; the divide between Savan and Shadutka rivers noted in A. 81; middle Assatcha R. Aug. 11th 1922 Hn No. 4226; Assatcha mts. at the source of Opala R. July 31st 1922 Hn No. 4090 (A. 186); the hot springs at Savan R. July 31st 1921 Hn No. 2506 (A. 78 c); Topik volcano 580 m. July 28th 1921 Hn No. 2490; W. of Topik volcano in *Pinus pumila* thickets noted by Hn; Akhomten Bay noted in A. 29, A. 32, A. 33, A. 38; Gorelaja volcano noted in A. 162, A. 163, A. 167, A. 169; Opala volcano 1100 m. July 21st 1921 Hn No. 2283; do. 1040 m. July 21st 1921 Hn No. 2313 (A. 75); near the mouth of Artemjeva R. noted by Hn; Ipelka R. July 14th 1921 Hn No. 2159 (var. *rosea*); lower Bolshaja R. noted in A. 110; Bolsheredsk Bezais 1909, do. July 8th 1921 Hn No. 2040; Apatcha village noted by Hn; Mt. »Gorelaja gora» (Paratunka valley) Komarov 1908; Paratunka village Komarov 1908 (Hb. Berol.); Nikolajevsk Komarov 1908 (partly var. *rosea*); Mt. Stoll between Apatcha and Natchika noted in A. 121; the Shalsan valley Komarov 1908; Mt. Zerkalo, Natchika noted in A. 117; Poperochnaja R. Komarov 1908 (var. *rosea*); Mt. Palovinaja 800 m. July 8th 1920 Hn No. 336 b; the Korjaka valley Komarov 1908.

East Kamtchatka: Petropavlovsk »*Spiraea chamaedrifolia* Linnaea 2 p. 2 ad portum Petro Pauli Camtschatcae legit primo vero 1816 Ad. v. Ch. — Ad *Sp. betulifoliam* Pall. I p. 33 t. 16 (illegible) Ad. v. Ch.» (Hb. Berol.), do. Mertens, do. Perfiljef 1909 (Hb. Holm.), do. July 17th 1920 Hn No. 482; the Kalashtyrka valley Komarov 1908; Avatcha volcano 1500 feet Perfiljef 1911, do. 700 m. July 31st 1920 Hn No. 654; Cape Shipunski Ditmar acc. to Maxim. loc. cit.; the Kronoki path Komarov 1909; Lake Kronoki Komarov 1909; cape Kozlof June 30th 1923 Malaise.

Central Kamtchatka: The hot springs at Malka Shukovski 1908; the summit of Mt. Zerkalo Malka July 27th 1924 P. T. Novogroblenof (Hb. Holm.); Mashura Komarov 1909; Shtchapina Komarov 1909; Anauna R. Sept. 5th 1926 Malaise No. 165, do. Aug. 19th 1926 Malaise No. 164; Tolbatchik acc. to Kom. loc. cit.

West and North Kamtchatka: Kishtchik R. Rubinski 1909; between Sedanka and Jelovka Bezais 1909; Tigil Erman (Hb. Berol), do. Levitzky, do. Bezais 1909, do. Gudzenko 1910; Uka Yokoyama acc. to Koidz. loc. cit.; Karaga (Hb. Sapporo); Pallan Savtchenko 1911; Karaginsk Island Mertens.

»Kamtchatka»: »Fischer misit 1829»; »Hb. Steven in Hb. Boiss.» acc. to Schneider loc. cit., Kastalsky, Kittlitz, Rieder 1831 (sub *S. chamaedrifolia*).

Noted in the following associations:
In *Vaccinium—Empetrum—Rhododendron chrysanthum* ass.:
Single (A. 117); Sparse (A. 162, A. 167, A. 169).
In *Pinus pumila—Spiraea*—Moss ass.:
Single (A. 29, A. 32, A. 75).
In *Pinus pumila—Spiraea—Sphagnum* ass.:
Scattered (A. 186); Abundant (A. 121).
In *Pinus pumila—Rhododendron*—Moss ass.:
Single (A. 33); Sparse (A. 81, A. 163).
In *Alnus—Calamagrostis—Dryopteris* ass.:
Single (A. 204).
In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 38).
In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 78 c).
In *Carex—Myrica* ass.:
Single (A. 110).

In South Kamtchatka this plant is very common from the lowlands practically up to the alpine limit of vegetation. It is especially characteristic of all *Pinus pumila* thickets, where it is almost always to be found, and also of the *Vaccinium—Empetrum—Rhododendron chrysanthum* ass. of the mountains. In the lowlands it appears as a shrub about half a metre high with large leaves (about 6×4 cm.). The height of the plant and the size of the leaves gradually diminish at higher altitudes and in the alpine *Vaccinium—Empetrum—Rhododendron chrysanthum* ass. it is a low plant 1,5—2 dm. high with small leaves (about $1{,}7 \times 1{,}2$ cm.). The form of the leaves, the length of the petioles, the form of the inflorescence and other characteristics vary a good deal, but it has not been possible for me to divide the material into distinct types, although an attempt to do so was actually made during the fieldwork. Some of the specimens here called var. *rosea* Maxim. have reddish flowers. As they also have more pyramidal inflorescence they may represent a separate type. However, certain characteristics are always present which differentiate our plant from its Western American counterpart hitherto called *S. lucida* Dougl. or *S. corymbosa* Raf. var. *lucida* Zab. The sepals of our plant are always reflexed in the fruit state; the follicles have the styles affixed to their back, below the apex; they are somewhat rugulose and hairy, not shiny and glabrous; the branches of the inflorescence are thin and when young always pubescent (in a later stage of development traces of this pubescence are always present); the petioles, although their length varies a good deal, are always shorter than those of the American plant and the leaves are not sharply serrulated but have a characteristic rounded serrulation going down nearly as far as to the petiole.

The lowland-form of our plant has always before been taken as *S. betulifolia* Pall. while different alpine forms have been given different names, such as *S. betulifolia* var. *ajanensis* Schneider, *S. Aemiliana* Schneider, *S. Beauverdiana* Schneider, *S. Stevenii* Rydb. and others. *S. betulifolia* Pall., however, was based on a specimen collected by Steller, which Pallas, following Gmelin, thinks originates from Maja river. He writes loc. cit.: ». . . . mihi tantum imperfecte cognita est e surculis inter plantas siccas Stellerianas inventis, quibus Vir accuratissimus adscripserat locum Majam fl. ultra Lenam fluentem.» This specimen, illustrated in Fl. Ross. I tab. 16, is still to be found in Hb. Hort. Petrop. labelled »Spiraea quam in Kamtchatka loco . . . . (illegible, possibly »Ilieae») adhibent». As is seen from the illustrated specimen, it is in fruit and differs from our plant in having erect sepals, styles affixed practically at the prolonged apex of the shiny glabrous (except on the inner suture) follicles, completely glabrous, comparatively thick panicle branches, comparatively long-petiolated leaves sharply serrulated on their upper half but practically entire near the base. In all these characteristics it agrees with the plant usually called *S. lucida* or *S. corymbosa* var. *lucida*, and it seems to be necessary to assume that the specimen was collected by Steller in North America unless the same form can be shown to occur somewhere in Asia. Similar mistakes in locality are common in the case of Steller's plants. This is easy to understand as Steller died on his way back to Europe. In North American flora *S. lucida* is said to go to the north to British Columbia. The place visited by Steller, which Bering called St. Ilii Island, is situated in 144° 30′ W. long on the south coast of Alaska[1] and I do not know if *S. lucida* is known to occur so far to the north.

In any case, the species described by Pallas as *S. betulifolia* is certainly not our plant. It proved difficult to find an earlier name that could beyond doubt refer to our species and I therefore preliminarily adopt the name *S. Beauverdiana* which is undoubtedly referable to our plant. It seems probable, however, that a closer revision on the subject might bring to light an earlier name for it.

Type of distribution: Eastern Asiatic—Western American.

Geographical area: Asia: from Verchojansk and Jakutsk districts eastwards to Chukch Penins., southwards to northern Manchuria and Honshu, also in northern China. America: from Port Clarence and Alaska Penins. eastwards to Yukon. (*S. lucida* Dougl. = *S. betulifolia* Pall. *vera*, acc. to N. Amer. Fl. from British Columbia to Saskatchewan, southwards to Oregon and Wyoming). The very closely related *S. corymbosa* Raf. acc. to N. Amer. Fl. from New York to Kentucky, southwards to Georgia.

490. ***Spiraea media*** Schmidt in Österr. allgem. Baumz. I (1792) p. 53 tab. 54.

[1] Compare F. A. Golder, Bering's Voyages II Am. Geogr. Soc. Research series No. 2 (1925) p. 43.

MAXIM. in Acta Hort. Petrop. VI (1879) p. 187; KOM., Voy. Kamtch. pp. 192, 412, 454; KOM., Fl. Penins. Kamtsch. I p. 331. — *Spiraea chamaedryfolia* PALLAS, Fl. Ross. I p. 32 quoad pl. Kamtsch.; KITTLITZ, Denkw. II p. 258. — ? »*Spiraea foliis integerrimis, umbellis sessilibus*» L., Amoen. Acad. II ed. I (1751) p. 337 et Pl. Rar. Kamtsch. p. 5. — *?Spiraea hypericifolia* PENNANT, Arct. Zool. (1784) p. CXV; GEORGI, Beschreib. III: 4 p. 1020. — *?Spiraea crenata* MERTENS, Fl. Koragins p. 63.

South Kamtchatka: Lake Dalni KOMAROV 1908 (Hb. Berol.); Savoiko KOMAROV 1908, do. KOMAROV 1909 (Hb. Berol., Hb. Holm.), do. July 7th 1920 HN No. 293, do. July 7th 1920 HN No. 294 a (f. *foliosa*), do. July 8th 1921 HN No. 3626 (P. T. NOVOGRABLENOF); near Korjaka village RUBINSKI 1908; Korjaka KOMAROV 1909.

East Kamtchatka: Petropavlovsk W. EYERDAM 1928; Ustj-Kamtchatka Aug. 1925 MALAISE No. 465.

Central Kamtchatka: Malka KOMAROV 1909 (Hb. Berol); Lake Ovalni near Korjatskaja KOMAROV 1908; between Ganala and Pushtchina GRINOP 1909; Malaja Nikkolki KOMAROV 1909; Kosyrevsk PROTOPOPOF 1909; Klutchi BEZAIS 1908, do. AFANASEJEV 1909, do. June 16th 1921 HN No. 3353 (MALAISE); »the Kamtchatka valley» DYBOVSKY 1879.

West and North Kamtchatka: Tigil LEVITZKY 1848; »Häufig bei Tigil» RIEDER 1833, Tigil GUDZENKO 1910; ?Karaginsk Island acc. to MERTENS loc. cit. sub *S. crenata*.

»Kamtchatka»: DYBOVSKY (sub *S. sericea*).

In South Kamtchatka this species was found only in the northern part. It seems to be more common further to the north in the Peninsula.

The monstrous form represented by HN No. 294 a was described by LAMARCK as *S. foliosa* in POIR., Encycl. VII p. 353. It has very large, entire, acute, ovate sepals.

Type of distribution: Bicentric, European and Siberian.

Geographical area: Europe: In Poland, Serbia, Volhynia, Podolia, Hungary, Bosnia and Carniola, also in N. E. Russia and the central Urals. Asia: throughout Siberia from the mouth of Yenisei, Verchojansk distr., middle Kolyma and Gishiginsk southwards to Tian-shan, Mongolia, ?northern China, Corea and Yezo. Not known from the southernmost Kamtchatka or the northern Kuriles, nor from Honshu.

491. ***Spiraea salicifolia*** L., Sp. pl. ed. I (1753) p. 489.

CHAM. in Linnaea VI (1831) p. 589; ERMAN, Verzeichn. p. 64; KITTLITZ, Denkw. II p. 258; LEDEB., Fl. Ross. II p. 15; MAXIM. in Acta Hort. Petrop. VI (1879) p. 209; KOM., Voy. Kamtch. pp. 233, 240, 243, 412, 454 et Fl. Penins. Kamtsch. I pp. 36, 331, 332.

South Kamtchatka: The hot springs at Savan R. 110 m. July 31st 1921 HN No. 2507; middle Kanecheva R. noted by HN; Bolsheredsk July 11th 1921 HN No. 2115; Nikolajevsk KOMAROV 1908; »Stary Ostrog» (= Savoiko) VOSSNESENSKY 1848, do. EYERDAM 1928.

East Kamtchatka: »Petropavlovsk and Avatcha» STEWART; Petropavlovsk Aug. 7th 1921 HN No. 3635 (P. T. NOVOGRABLENOF); Nishne Kamtchatsk Sept. 1846 VOSSNESENSKY; Lake Chartchina BEZAIS 1909 (Hb. Berol.).

Central Kamtchatka: Ganala PROTOPOPOF 1908; Sharomsk PROTOPOPOF 1908; Milkova PROTOPOPOF 1908; do. KOMAROV 1909; Kirganik KOMAROV 1909; Mashura KOMAROV 1909; Shtchapina KOMAROV 1909, do. July 17th 1921 HN No. 3447 (MALAISE); Tolbatchik KOMAROV 1909; Klutchi BEZAIS 1908 (Hb. Berol.).

West and North Kamtchatka: Sedanka BEZAIS 1908; Tigil LEVITZKY 1848, do. »Ad. ERMAN AD. V. CH.» (Hb. Berol.), do. GUDZENKO 1910.

In South Kamtchatka this plant was only seen in the localities enumerated above, but it seems to be fairly common further to the north, especially in the central valley. It flowers in July and the beginning of August.

Type of distribution: Bicentric, European and Siberian.

Geographical area: Europe: Austria, Bohemia, Moravia, Polonia and S. W. Russia (probably not indigenous but naturalized). Asia: from eastern Obi R. eastwards at Yenisei from about 64° N. lat., from middle Kolyma R. and Chukch Penins. (N. E. Asiatic specimens belong to var. *alpestris*) southwards to northern Mongolia, northern China and Honshu. America: occasionally escaped from cultivation in the eastern states. In America closely related species.

492. ***Aruncus sylvester*** KOSTELETZKY in Ind. Hort. Prag (1844) p. 15 (nomen nudum? — Not seen).

MAXIM. in Acta Horti Petrop. VI (1879) p. 170 (var. *kamtschatica*); YABE & YENDO, Fl. Shimushu p. (186); KOM., Voy. Kamtch. pp. 91, 414, et Fl. Penins. Kamtsch. p. 372; KUDO, Fl. Paramush. p. 119 (var. *kamtschatica*). — *Drymopogon* STELLER, Beschreib. Kamtsch. p. 93. — »*Spiraea foliis supra decompositis spicis paniculatis . . .*» GMEL., Fl. Sib. III p. 192. — *Spiraea Aruncus* PENNANT, Arct. Zool. (1784) p. CXV; GEORGI, Beschreib. III: 4 p. 1022; PALLAS, Fl. Ross. I p. 39; MERTENS, Bemerk. Fl. Koragins p. 63; CHAM. & SCHLECHT. in Linnaea II (1827) p. 2; CHAM. in Linnaea VI (1831) p. 289; ERMAN, Verzeichn. p. 64; HOOK. & ARNOTT in Beechy's Voy. p. 113; LEDEB., Fl. Ross. II p. 16.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: N. W. of Kurile Lake noted by HN; lower Ozernaja R. GUDZENKO 1910; N. of Illina volcano noted by HN; Javina RUBINSKI 1909; upper Unkanakchek R. in *Alnus* thickets noted by HN, do. noted in A. 203; Sahach volcano noted by HN; upper Ksudach R. noted in *Betula* forests by HN; between the mouths of Opala and Golygina rivers in *Epilobium angustifolium—Geranium—Majanthemum* ass. noted by HN; S. of Golygina village noted by HN; middle Ksudach R. noted by HN; sources of the western Shadutka R. in *Betula* forest noted by HN; N.W. slope of Assatcha mts. 410 m. in *Betula* forest noted by HN; Assatcha mts. July 31st 1922 HN No. 4084;

Akhomten Bay noted in A. 27, A. 28, A. 35, do. in an open spot in the *Alnus* belt noted by Hn; do. in *Epilobium—Geranium—Majanthemum* ass. noted by Hn; upper Udoshk R. noted by Hn; Opala volcano noted in A. 78 a; lower Bolshaja R. noted by Hn; Ipelka R. noted in A. 57; Bolsheredsk noted by Hn; E. of Bolsheredsk noted by Hn; Mt. Gorachie Gora (Paratunka valley) Komarov 1908; Toporkoff Island (= Starichkoff Island) Perfiljev 1911; Shalsan Aug. 11th Vossnesénsky; Mt. Tshapotchka (Natchika) Komarov 1908; Mt. Zerkalo, Natchika noted in A. 118; Savoiko Komarov 1908, do. July 7th 1920 Hn No. 271 a; »surroundings of Avatcha Bay» Juni 23rd 1847 Vossnesensky (sub *Spiraea Camtschatica*); Avatcha Bay acc. to Hook. & Arnott loc. cit.

East Kamtchatka: Petropavlovsk Chamisso (Hb. Berol.), do. Mertens, do. Wright (1853—56), do. Rubinski 1908, do. Komarov 1908, do. Aug. 16th 1920 Hn No. 882; between Petropavlovsk and Avatcha volcano noted in A. 9, A. 18, A. 24 a; Nalutcheva Perfiljev 1910; Avatcha volcano noted by Hn; Kichpinitch volcano Komarov 1909; Mt. Krascheninnikof Komarov 1909; Lake Kronoki Komarov 1909.

Central Kamtchatka: Sharomsk Protopopof 1908; Anauna R. Sept. 5th 1926 Malaise No. 166; Klutchi Bezais 1908, do. Afanasejev 1909.

West and North Kamtchatka: Kompakovaja Zelenin 1908; Tigil Erman, do. Levitzky 1848; Pallan Savtchenko 1911; Karaginsk Island Mertens, do. Postels, do. Loginovski 1910.

»Kamtchatka»: Eschscholtz, Stewart, Kastalsky, Kusmischeff, Kittlitz, Rieder (sub *β americana*), »misit Ledebour» 1832 (Hb. Holm.), »Capit. Werngren» (Hb. Holm.).

Noted in the following associations:

In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 9, A. 18).

In *Betula Ermani—Filipendula—Dryopteris* ass.:
Single (A. 24 a).

In *Betula Ermani—Filipendula—Equisetum hiemale* ass.:
Sparse (A. 57).

In *Alnus—Glyceria—Athyrium* ass.:
Single (A. 27, A. 28, A. 35, A. 203).

In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Single (A. 78 a, A. 118).

In South Kamtchatka this plant is common in the *Betula* forests and *Alnus* thickets, occurring also in the lowland, subalpine and even alpine meadows up to the lower alpine region. It flowers in July and August.

It is found over a very large geographical area from Europe over Central Asia to Eastern America and, like most similar plants, occurs in several different forms, which, however, seem to be too little studied to allow of separation of distinct types within the species. The Kamtchatka plant was

described by Maximovicz in Acta Horti Petrop. VI (1879) p. 170 as var. *kamtschatica*, characterized by male flowers double as large as the female; short, linear-oblong densely imbricate racemes; distinct ovaries and follicles double as long as broad. It was on this variety that Rydberg in Fl. N. Amer. 22: 3 (1908) p. 256 founded his species *Aruncus kamtschaticus*, with the type locality »Kamtchatka, near Petropavlovsk», and described as having more or less deeply laciniated leaves and short follicles only 2 mm. long. It seems to me to be the alpine form of the plant, which has shorter and denser racemes, shorter follicles and (like undeveloped specimens of the lowland form) more laciniated leaves. Our plant attains a height of up to 2 m. with inflorescence up to 3 dm. long; the petals are comparatively narrow and the follicles about 3 mm. In the young male flowers the ovary is clearly visible, but it degenerates at a later stage of development.

Type of distribution: ?

Geographical area: Europe: In the central European mts. from the Vosges and Moselle eastwards to Warsaw and Dnjepr, the Caucasus. Asia: Armenia, Persia, the Himalayas, Mongolia, Transbaikalia, in Eastern Asia northwards to Olekminsk, Verchojansk and Jakutsk districts and Chukch Penins., southwards to Yunnan, Corea and Kiushiu. America: from Alaska and New York southwards to Oregon and Georgia. Rydberg divides the American plant into the species *A. kamtschaticus*, *A. acuminatus*, *A. pubescens* and *A. allegheniensis*.

493. ***Sorbaria sorbifolia*** (L.) A. Br. in Aschers., Fl. Brandenb. (1864) p. 177.

Kom., Voy. Kamtsch. p. 454. — »*Spiraea foliis pinnatis*» L., Amoen. Acad. II ed. I p. 352 (Pl. Rar. Kamtsch. p. 19). — *Spiraea sorbifolia* L., Sp. pl. ed. I (1753) p. 490; Pennant, Arct. Zool. (1784) p. CXV; Pallas, Fl. Ross. I p. 38; Georgi, Beschreib. III: 4 p. 1022; Ledeb., Fl. Ross. II p. 15.

Central Kamtchatka: Shtchapina (Malaja Nikkolki) Komarov 1909, do. July 23rd 1921 Hn No. 3476 (Malaise); Kunchekla (Malaja Nikkolki) Komarov 1909 (Hb. Berol.); the right bank of Kosyrevsk river Protopopof 1909.

In Kamtchatka this characteristic species seems to be confined to the central valley.

Type of distribution: Siberian.

Geographical area: Asia from N.E. Tomsk prov. eastwards, at Yenisei from about 63° ½ N. lat., at Lena from Vilju distr., from Ochotsk and the southern Kuriles southwards at Yenisei to about 57° N. lat., to Transbaikalia, northern China (var.) and Honshu, also in Central Kamtchatka. (Rare in the western part of the area, common from Transbaikalia eastwards.) Introduced into eastern N. America.

In Central China and the Himalayas closely related species.

494. ***Sorbus kamtschatcensis*** Kom. in Not. Syst. Herb. Hort. Bot. Petrop. II (1921) p. 135 (*Kamtschatensis*).

»eine Eberesche mit hohem Stamme» DITMAR, Reisen II p. 88. — *Sorbus Aucuparia* KITTLITZ, Denkw. I p. 321, II p. 32; KOM., Voy. Kamtch. p. 454.

South Kamtchatka: N. of the hot springs at Siku R. July 5th 1922 HN No. 3841; Savoiko between »Pilnaja tundra» and »Svetloj klutch» KOMAROV 1908; Savoiko PROTOPOPOF 1909, do. July 5th 1920 HN No. 218; Hutor June 26th 1928 W. EYERDAM.

Central Kamtchatka: Between Kirganik and Mashura acc. to KOM., Voy. Kamtch. p. 237; Shtchapina acc. to KOM. in Not. Syst. Herb. Bot. Petrop.; Kosyrevsk PROTOPOPOF 1909; Klutchi AFANASEJEV 1909; lake Kurarotchnoje AFANASEJEV 1909; between Nishne Kamtchatsk and Kamaki July 2nd 1925 MALAISE No. 467.

This species was only seen on the northern border of the area investigated by me. It apparently belongs to the group of plants that prefer the continental part of the Peninsula. It is a high, slender tree with the habitus of *S. aucuparia*, to which it is certainly closely related. It flowers in July. Its old Kamtchadal name was acc. to KITTLITZ loc. cit. »Kokschm».

It is with great hesitation that I retain the name of this plant given to it by KOMAROV. Our species comes very close to *S. sibirica* HEDL. and might well prove to be identical with it. As, however, I have too little material of that species for purposes of comparison, and as, furthermore, no less than 45 new species belonging to the section *Aucuparia* have recently been described from northern and eastern Asia (by SARGENT, KOEHNE and KOMAROV), no specimens of which, or only very poor ones, are available, it is impossible for the present to form a personal opinion of the systematical position of our plant, and I therefore refer it to KOMAROV's special Kamtchatka species.

Further investigation will prove whether it can be retained as a separate species or whether it must be united with *S. sibirica* or with any other of the many closely related forms.

In the original diagnosis KOMAROV writes that *S. anadyrensis* and *S. kamtschatcensis* occupy completely isolated geographical areas. As, however, *S. sibirica* is known from the Kolyma distr., the area of the plant named by KOMAROV *S. anadyrensis* might well be connected with that of the former. It is very common for a plant that prefers more continental conditions to occupy an isolated area in central Kamtchatka (for instance *Sorbaria sorbifolia*) and this fact would hardly indicate that it represents a separate form.

Type of distribution: ?

Geographical area: So far only known from our area.

495. ***Sorbus sambucifolia*** (CHAM. & SCHLECHT.) ROEM., Fam. Nat. Synops. Fasc. III (1847) p. 139.

KOIDZ., Pl. Yokoyam. p. 212; HEDLUND, Monogr. Gatt. *Sorbus* p. 37; FEDTSCH., Fl. Îl. Comm. p. 56; KOM., Voy. Kamtsch. pp. 412, 454 et Fl. Penins. Kamtsch. pp. 36, 331, 333; KUDO, Fl. Paramush. p. 119. — *Sorbus* KRASCHENINNIKOF, Kamtsch. p. 100; PALLAS in Stralsund. Mag. V (1769) p. 427. — *Sorbus aucuparia* PENNANT, Arct. Zool. (1784) p. CXV; PALLAS, Fl. Ross. I p. 28; LANGSDORFF, Be-

merk. p. 229. — ». . . . der Kamtschadalische *Sorbus*» MERTENS, Bemerk. Fl. Koragins pp. 64, 71. — »*Pyrus (Sorbus) sambucifolia*» CHAM. & SCHLECHT. in Linnaea II (1827) p. 36 et in Linnaea VI (1831) p. 590; CHAMISSO, Reise u. d. Welt p. 346; ERMAN, Verzeichn. p. 64. — *Pyrus sambucifolia* HOOK. & ARNOTT in Beechy's Voy. p. 114; LEDEB., Fl. Ross. II p. 99; DITMAR, Reisen I p. 109; YABE & YENDO, Fl. Shimushu p. (186). — *Pyrus sorbifolia* KITTLITZ, Denkw. I p. 323, II p. 272. — »die Eberesche im *Betula Ermani*-Walde» DITMAR, Reisen II p. 88; »Eberesche» DITMAR, Reisen I pp. 296, 351, 429, 447, 551, 563, 687, 715, 717.

Northern Kuriles: Paramushir S. YOKOYAMA 1893 acc. to KUDO loc. cit., KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka, east coast June 22nd 1920 HN No. 85 (creeping form); Kurile Lake noted by HN; »mys Perisheik, Ozernaja» RUBINSKI 1909; N. of Ozernaja village noted by HN; upper Unkanakchek R. noted in *Betula* forest by HN, do. noted in A. 204; upper Kusingen R. noted in A. 189; Ksudach volcano noted in *Betula* forest by HN; N. of the mouth of Golygina R. in heath noted by HN (creeping form); W. of Shadutka volcano noted by HN; Topic in *Pinus pumila* thickets noted by HN; middle Opala R. in *Betula* forest noted by HN; Assatcha mts. 410 m. noted in *Betula* forest by HN; S. of Ipelka common in the extensive *Betula* forest; Akhomten Bay noted in A. 29, A. 30; Opala volcano 400 m. July 20th 1920 HN No. 2238, do. noted in A. 75; upper Abshen R. noted in *Betula* forest by HN; Ipelka R. in *Betula* forest noted by HN; Agashka R. noted in A. 62, A. 64; the Kohelok mt. 410 m. in *Betula* forest noted by HN; the valley of »Malenki Klutchik R.» 425 m. noted by HN; S. of the hot springs at Siku R. in *Betula* forest noted by HN; Bannaja RUBINSKI 1908, do. in *Betula* forest noted by HN; between Paratunka and Mikisha KOMAROV 1908; Lake Dalni KOMAROV 1908 (Hb. Berol.); between Shalsan and Apatcha VOSSNESENSKY 1847; Uzdetz R. KOMAROV 1908; Natchika KOMAROV 1908; Mt. Zerkalo, Natchika 400 m. noted in A. 115; Palovinaja R. KOMAROV 1908; between Savoiko and Korjaka KOMAROV 1908; lower Avatcha R. acc. to DITMAR loc. cit. p. 687; »Avatcha Bay» acc. to HOOK. & ARNOTT loc. cit.; Vaktal R. acc. to DITMAR loc. cit. p. 717.

East Kamtchatka: Petropavlovsk CHAMISSO acc. to CHAM. & SCHLECHT. loc. cit., do. MERTENS, do. YOKOYAMA acc. to KOIDZ. loc. cit., do. KOMAROV 1909, do. PERFILJEF 1910, do. July 2nd 1920 HN No. 171, do. noted in A. 129 b; between Petropavlovsk and Savoiko July 18th 1921 HN No. 3634 (NOVOGRABLENOF); between Petropavlovsk and Avatcha volcano noted in A. 7, A. 9, A. 18 and A. 23; Avatcha volcano 675 m. July 31st 1920 HN No. 676; Shupanova R. acc. to KOM. loc. cit.; Semjatchik acc. to KOM. and DITMAR loc. cit.; Uzon acc. to KOM. loc. cit.; Lake Kronoki acc. to KOM. loc. cit.; the Kronoki Pass acc. to KOM. loc. cit.; Klutchevskaja volcano KURTASHOF 1909; Nishne Kamtchatsk acc. to DITMAR loc. cit. p. 351; Ustj-Kamtchatsk Aug. 1925 MALAISE No. 466.

Commander Islands: Bering Island KJELLMAN, DYBOVSKY 1879, GREBNITZKY 1894 and acc. to FEDTSCH. loc. cit. STELLER and STEJNEGER; Copper

Island DOBROTVORSKY 1881 and acc. to FEDTSCH. loc. cit. STEJNEGER and MOROZEVICZ.

Central Kamtchatka: Malka acc. to KOM. loc. cit.; the Ganala »tundra» KOMAROV 1909; Kamtchatka vershina acc. to KOM. loc. cit.; Pushtchina acc. to DITMAR loc. cit. p. 429; between Sharomsk and Vershne-Kamtchatsk KOMAROV 1909; Klutchi BEZAIS 1908.

West and North Kamtchatka: Itchinsk BJELOUSSOF 1914; »Gebirge des Westrandes Ad ERMAN AD. v. CH. *Pyrus (Sorbus) sambucifolia* n.» (Hb. Berol.); Tigil acc. to DITMAR loc. cit. p. 551; Sedanka acc. to DITMAR loc. cit. p. 563; Karaginsk Island MERTENS, do. LOGINOVSKI 1910, do. GUDZENKO 1910.

»Kamtchatka»: »*Pyrus (Sorbus) sambucifolia* Nob. Kamtschatka Hb. CHAMISSO» (Hb. Acad. Petrop. probably the type specimen from Petropavlovsk); LANGSDORFF, CHORIS, MERTENS, WORMSKIOLD (sub *Pyrus pseudosorbus* Hb. MEYER), PETERS, RIEDER (Hb. Berol.), DYBOVSKI 1879.

Noted in the following associations:

In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 7, A. 9); Scattered (A. 18); Abundant (A. 23).

In *Betula Ermani—Filipendula—Dryopteris* ass.:
Single (A. 30); Sparse (A. 115); Scattered (A. 62, A. 64).

In *Alnus—Calamagrostis—Dryopteris* ass.:
Sparse (A. 129 b, A. 189, A. 204).

In *Pinus pumila—Spiraea*—Moss ass.:
Sparse (A. 29, A. 75).

In South Kamtchatka this species is common in all *Betula* forests up to their altitudinal limit. It also occurs in the *Alnus* region and rarely on the open heaths of the lower alpine region — in the latter case as a low (decimetre-high) creeping shrub. In the *Betula* forests it sometimes forms extensive thickets about 2 m. high, which it is somewhat difficult to penetrate, but there is no special *Sorbus* region, although such a region is sometimes reported in literature. The berries are about a centimetre long, oblong with erect sepals in the ripe state. They are much sweeter than those of *S. aucuparia* and are frequently eaten by the natives. They make a fairly palatable jam, which, however, might be more pleasant were it not for the stiff sepals. The description of the species is based on specimens collected at Petropavlovsk.

It flowers in the end of June and the beginning of July; the berries are ripe in September. The old Kamtchadal name was acc. to KITTLITZ loc. cit. »Kokainen».

Type of distribution: Asiatic Pacific.

Geographical area: Gishiginsk distr., Ochotsk distr., Udskoj distr., Kamtchatka and Commander Islands, southwards to De Castri Bay, Yezo and mts. of Honshu. Reports from W. America should be referred to *S. scopulina* GREENE.

Sorbus pumila RAFIN. and **Sorbus sitchensis** ROEM.

Both species are reported from Kamtchatka in HEDLUND, Monogr. Gatt. *Sorbus* pp. 39 and 40. These reports are doubtless founded on a sheet in Hb. Holm. labelled »Herb. Acad. Petrop. *Pyrus sambucifolia* Ad portum St. Petri et Pauli Camtschatkae Exped. LÜTK. 1857 C. A. MEYER 1841» on which are fixed two twigs determined by HEDLUND, the one to »*S. sitchensis* ROEM.?» and the other to *S. pumila* RAFIN.

The specimens are certainly incorrectly labelled, and as furthermore MERTENS, the botanist of LÜTKE's expedition, reports the Kamtchatka species *Sorbus sambucifolia* from Sitcha, the labels on the specimens may have been changed.

Both plants must be excluded from the flora of our area.

496. ***Crataegus chlorosarca*** MAXIM. in Bull. Soc. Nat. Mosc. 54 (1879) p. 20.

SCHNEIDER, Ill. Handb. Laubholzk. I p. 773; KOM., Voy. Kamtch. pp. 28, 452 et Fl. Penins. Kamtsch. I p. 329. — *Crataegus Oxyacantha* PENNANT, Arct. Zool. (1784) p. CXV; GEORGI, Beschreib. III: 4 p. 1009 quoad pl. Kamtsch.; LANGSDORFF, Bemerk. p. 231. — *Oxyacantha* PALLAS in Stralsund Mag. V (1769) p. 427. — *Crataegus sanguinea*[1] PALL., Fl. Ross. I p. 25 quoad pl. Kamtsch.; SCHNEIDER, Ill. Handb. Laubholzk. I p. 771 quoad pl. Kamtsch.; KUDO in Jap. Journ. Bot. II (1925) p. 262 quoad pl. Kamtsch. — »*Crataegus*» KITTLITZ. Denkw. II pp. 233, 321; DITMAR, Reisen I pp. 108, 297, 374, 422, 429, 447, 687, 715, 717, 731, 737, Reisen II pp. 81, 83, 88.

South Kamtchatka: lower Kusetenek R. in meadow noted by HN; Golygina R. 16 verst above the village RUBINSKI 1909; upper Ksudach R. noted by HN; upper Abshen R. noted by HN; the mouth of Artemjeva R. noted by HN; S. of Bolsheredsk in meadow noted by HN; between Karymchina and Bannaja rivers RUBINSKI 1908; between Siku R. and Apatcha noted by HN; lower Bannaja R. noted by HN; Apatcha noted by HN (at June 14th flowers not yet burst); lower Avatcha R. acc. to DITMAR loc. cit. p. 687; Savoiko KOMAROV 1908, do. July 7th 1920 HN No. 247 b; between Savoiko and Korjaka acc. to DITMAR loc. cit. p. 715; Topolovaja R. between Natchika and Korjaka KOMAROV 1908; Korjaka KOMAROV 1908; N. of Korjaka acc. to DITMAR loc. cit. p. 717.

East Kamtchatka: Petropavlovsk RUBINSKI 1908; between Petropavlovsk and Savoiko July 5th 1920 HN No. 202 a, do. Sept. 18th 1921 HN No. 3279; Semjatchik acc. to DITMAR loc. cit. p. 297.

Central Kamtchatka: Pushtchina acc. to DITMAR loc. cit. pp. 429, 731; Milkova PROTOPOPOF 1908; the Shtchapina Pass KOMAROV 1909; Klutchi Sept. 4th 1846 VOSSNESENSKY, do. BEZAIS 1908, do. AFANASEJEV 1909, do. July 1st 1921 HN No. 3407 (MALAISE); between Klutchi and Kamaki July 15th 1926 MALAISE No. 163.

[1] KRASCHENINNIKOF (Kamtsch. p. 100) reports »*Oxyacantha fructu nigro*» and »*Oxyacantha fructu rubro*» from Kamtchatka. The latter report evidently caused PALLAS and later authors' reports of *C. sanguinea* from the Peninsula. Otherwise I am not aware of any *Crataegus* species there other than *C. chlorosarca*, although *C. sanguinea* might well be expected within our area, as it is known from Yezo, Saghalin and the Jakutsk distr.

West and North Kamtchatka: Valley of Oblukovina R. Rubinski 1908; Tigil Levitzky 1848 (unreliable, the place is not given in the original label).

»Kamtchatka»: Kastalsky, Rieder, Dybovsky 1879.

In South Kamtchatka this species is fairly common, always occurring as low (3—4 m.) scattered isolated trees in the alluvial meadows, where however it is rarely entirely absent. It is a tree of very characteristic form (fig. 6), usually surrounded by the remains of old dry trunks. The thorns — when present — are 1—1,5 cm. long and shiny reddish-brown, but they are often entirely absent, at least from younger shoots. The pomes are black.



Fig. 6. *Crataegus chlorosarca.* Photograph from the middle Karymchina R., Kamtchatka.

The species was described from a specimen cultivated in Petrop., which was said to have grown up from seeds collected in Ussuri. In Fl. Mansh. II p. 471, however, Komarov states that no *Crataegus* with black pomes is otherwise known from Ussuri or Manchuria, and it is therefore uncertain whence the seeds that gave rise to the type-specimen originated. *C. chlorosarca* is certainly closely related to *C. sanguinea*, resembling especially the glabrous forms of that plant, but it nevertheless seems to me to represent a separate species. The nutlets are irregularly ridged and pitted on their ventral side. All the material of our plant that I have seen is very uniform.

Type of distribution: Asiatic Pacific.

Geographical area: Kamtchatka Penins., N. W. Yezo, Saghalin.

497. ***Rubus arcticus*** L., Sp. pl. ed. I (1753) p. 494.

Krascheninn., Kamtsch. p. 101; Pennant, Arct. Zool. (1784) p. CXV; Pallas, Fl. Ross. I: 2 p. 67; Mertens, Bemerk. Fl. Koragins p. 63; Cham. & Schlecht. in Linnaea II (1827) p. 8; Hook. & Arnott in Beechy's Voy. p. 113; Erman, Verzeichn. p. 63; Ledeb. Fl. Ross. II p. 70; Kittlitz, Denkw. I pp. 321, 324; Ditmar, Reisen I pp. 552, 574, Reisen II pp. 86, 94, 102; Yabe & Yendo, Fl. Shimushu p. (185); Focke in Bibl. Bot. Heft 72 (1911) p. 24 (var. *kamtschaticus*); Koidz., Pl. Yokoyam. p. 213; Kudo, Fl. Paramush. p. 120; Kom., Voy. Kamtch. p. 17 et Fl. Penins. Kamtsch. I p. 333. — »*Rubus foliis ternatis, caule inermi unifloro* .....» Gmel., Fl. Sib. III p. 179.

Northern Kuriles: Paramushir TARO 1892, SAKURAI 1910, KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Kurile Lake noted by HN; lower Ozernaja R. in *Sphagnum*-bogs noted by HN; near Ozernaja village noted by HN; N. E. of Javina village noted in A. 95; between Sisigenek R. and Kidipalok R. noted by HN; Sahach volcano noted in A. 192; Golygina village noted by HN; upper Ksudach R. noted in A. 87; upper Shadutka R. noted by HN; middle Assatcha R. Aug. 11th 1922 HN No. 4215; upper Opala R. noted in A. 184; the hot springs at upper Opala R. noted in A. 182; Akhomten Bay noted in A. 25; Mutnovskaja volcano 800 m. July 28th 1922 HN No. 4051; Gorelaja volcano noted in A. 162, A. 165, A. 167, A. 172; Opala volcano 620 m. July 21st 1921 HN No. 2261 (A. 78 a); the mouth of Stegnova R. noted in A. 219; Zykovaja noted in A. 217; the mouth of Artemjeva R. noted in A. 221; lower Bolshaja R. noted in A. 108; Ipelka R. noted in A. 60; Bolsheredsk noted by HN; Apatcha village June 17th 1922 HN No. 3817; the hot springs at Bannaja RUBINSKI 1909; Paratunka KOMAROV 1909; Mt. Zerkalo, Natchika noted in A. 118; Avatcha Bay acc. to HOOK. & ARNOTT loc. cit.

East Kamtchatka: Petropavlovsk CHAMISSO, do. YOKOYAMA acc. to KOIDZ. loc. cit., do. KOMAROV 1908, do. June 6th 1921 HN No. 1640, do. June 14th 1921 HN No. 1700; between Petropavlovsk and Avatcha volcano 350 m. Aug. 22nd 1920 HN No. 1010, do. noted in A. 20, A. 21; Avatcha volcano 675 m. July 31st 1920 HN No. 681; Ustj-Kamtchatsk BEZAIS 1908; do. June 6th 1925 MALAISE No. 470, do. July 1925 MALAISE No. 471, do. July 6th 1926 MALAISE No. 469.

Central Kamtchatka: Klutchi BEZAIS 1908, do. June 23rd 1921 HN No. 3379 (MALAISE); between Nishne Kamtchatsk and Kamaki July 2nd 1925 MALAISE No. 468.

West and North Kamtchatka: »Westküste von Kamtchatka» acc. to ERMAN loc. cit.; Chairusovaja NOVIKOV 1909; between Jelovka and Sedanka Aug. 20th 1927 VAVILIN (Hb. Holm.); Tigil LEVITZKY 1848, do. GUDZENKO 1910; »Ettolachan» R. (N. of Tigil) acc. to DITMAR loc. cit.; Uka (Hb. Sapporo); Karaga (Hb. Sapporo); Karaginsk Island acc. to MERTENS loc. cit., do. LOGINOVSKY 1910.

»Kamtchatka»: ESCHSCHOLTZ, LUBARSKY, KUSMISCHEFF, DYBOVSKY 1879.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 182); Sparse (A. 184).

In *Carex—Sanguisorba*—Moss ass.:
Single (A. 60, A. 87, A. 192, A. 219); Sparse (A. 221).

In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Single (A. 217); Sparse (A. 25).

In *Vaccinium—Empetrum*—Moss ass.:
Single (A. 95, A. 108, A. 172).
In *Carex—Myrica—Sphagnum* ass.:
Single (A. 20).
In *Carex—Myrica* ass.:
Single (A. 21).
In *Alnus—Calamagrostis—Veratrum* ass.:
Single (A. 165).
In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Single. (A. 78 a, A. 118).
In *Vaccinium—Empetrum—Rhododendron chrysanthum* ass.:
Single (A. 162, A. 167).

In South Kamtchatka this plant is fairly common in meadows, heaths and bogs up to the lower alpine region. It flowers in June and July.

Some of the specimens agree very well with the Scandinavian plant, but others differ from that type in having slightly larger, narrowly obovate or oblanceolate petals with long claw. This form was described and figured by Printz (Norske Vidensk. Selsk. Skr. 1916 No. 3 p. 13 tab. III et IV) as *Rubus arcticus* var. *grandiflorus* Ledeb. I could not find Ledebours type-specimen of this variety in Russian herbaria. The identification must be regarded as doubtful as Ledebours plant might as well be *R. acaulis*. Michx.

R. arcticus, *R. acaulis* and *R. stellatus* in America and Eastern Asia form a group which seems to require further study. (Compare under *R. stellatus*.) The geographical distribution of our plant in America is not clear. Fernald (Mem. Gray Herb. II 1925 p. 274) reports that *A. arcticus* occurs as well in Western as in Eastern America but is lacking in the region about the Great Lakes. It may be noted that the Eastern American area is isolated both to the east and to the west.

The old Kamtchadal name of our plant was acc. to Kittlitz loc. cit. »Igoltsch».

Type of distribution: ?

Geographical area: Europe: From northernmost Scandinavia, Kola and the northern Russian mainland southwards to Central Sweden, Gulf of Finland, Viatka and Perm. In the Urals southwards to about 54° N. lat. Some few isolated localities south of this line. Asia: from lower Yenisei, Lena and Kolyma rivers southwards to N. E. Tomsk prov., northern Mongolia, northern Corea, Saghalin and the southern Kuriles. America: from Alaska (69° N. lat.) southwards to Alberta (50° N. lat.) (acc. to Fernald). In Eastern America reported between Labrador (52° N. lat.) and Gaspé penins. (48° N. lat.) and in the region about the gulf of St. Lawrence. Not known from Greenland or Iceland. In America the very closely related species *R. acaulis* acc. to Fernald from Alaska (68° N. lat.) to Labrador (61° N. lat.) southwards to Wyoming (44° N. lat.) and Newfoundland (47° N. lat.). Reports of that species from Asia doubtful. (The specimens recorded by Kjellman as *R. arcticus* var. *grandiflorus* Ledeb. belong to *R. arcticus*).

Rubus caesius.

PENNANT, Arct. Zool. (1774) p. CXV.

The plant must be excluded from the flora of Kamtchatka.

498. ***Rubus chamaemorus*** L., Sp. pl. ed. I (1753) p. 494.

KRASCHENINN., Kamtsch. p. 101; PENNANT, Arct. Zool. (1784) p. CXV; PALLAS, Fl. Ross. I: 2 p. 66; GEORGI, Beschreib. III: 4 p. 103; LANGSDORFF, Bemerk. p. 229; MERTENS, Bemerk. Fl. Koragins p. 62; CHAM. & SCHLECHT. in Linnaea II (1827) p. 7; LEDEB., Fl. Ross. II p. 71; KITTLITZ, Denkw. I p. 321; DITMAR, Reisen I, p. 574, Reisen II, pp. 87, 94, 102; MIYABE, Fl. Kuril. p. 288; YABE & YENDO, Fl. Shimushu p. (185); FEDTSCH., Fl. Îl. Comm. p. 55; KOM., Voy. Kamtch. p. 453 et Fl. Penins. Kamtsch. p. 333; KUDO, Fl. Paramush. p. 120. — »*Rubus foliis simplicibus, lobatis, caule unifloro . . .*» GMEL., Fl. Sib. III p. 179. — *Chamaemorus* PALLAS in Stralsund. Mag. II (1768) p. 169 and V (1769) p. 428.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka, west coast June 19th 1920 HN No. 45; N. of Ozernaja village noted by HN; Golygina noted in heath by HN; N. of the mouth of Golygina R. in heath noted by HN; mts. at the hot spring at Savan R. noted in A. 78 c; the mouth of Artemjeva R. noted in A. 220; Gorelaja volcano 700 m. July 14th 1922 HN No. 3940; Opala volcano 620 m. July 21st 1921 HN No. 2340; between Opala volcano and Lake Tolmachovaja noted in A. 158; the mouth of Bolshaja R. July 5th 1921 HN No. 1966, do. noted in A. 45, A. 46, A. 49, A. 51; lower Bolshaja R. noted in A. 109 a; lower Karymchina R. noted by HN; Ipelka R. noted in A. 58, A. 59 a; S. of Bolsheredsk noted in *Carex—Rubus chamaemorus — Vaccinium — Empetrum* ass.; Apatcha noted by HN; between Apatcha and Natchika noted in A. 121; Nikolajevsk KOMAROV 1908; Natchika KOMAŘOV 1908; the Korjaka valley KOMAROV 1908 (Hb. Berol.).

East Kamtchatka: Kalashtyrka KOMAROV 1909; Semjatchik acc. to KOM. loc. cit.; Cape Kozlov June 30th 1923 MALAISE.

Commander Islands: Bering Island STELLER and STEJNEJER acc. to FEDTSCH. loc. cit., DYBOVSKY 1879, GREBNITZKY 1894; Copper Island STEJNEGER and MOROZEVICZ acc. to FEDTSCH. loc. cit.

Central Kamtchatka: Kamtchatka vershina acc. to KOM. loc. cit.; Mashura KOMAROV 1909.

West and North Kamtchatka: The mouth of Krutugorovaja R. BEZAIS 1909; Itchinsk BJELOUSSOF 1914; »Ettolachen» R. (N. of Tigil) acc. to DITMAR loc. cit.; Uka (Hb. Sapporo); Karaginsk Island MERTENS, do. LOGINOVSKI 1910.

»Kamtchatka»: LUBARSKY.

Noted in the following associations:

In *Carex—Rubus chamaemorus—Vaccinium—Empetrum* ass.:

Single (A. 45, A. 49, A. 51); Scattered (A. 58, A. 59 a, A. 100 a, A. 220); Abundant (A. 46).

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 158); Sparse (A. 78 c).
In *Pinus pumila—Spiraea—Sphagnum* ass.:
Sparse (A. 121).

In South Kamtchatka *R. chamaemorus* is fairly common, and characteristic of the *Carex—Rubus chamaemorus—Vaccinium—Empetrum* ass. of the lowlands (on peat) but it is also occurring in the heaths of the lower alpine region, as well as along the border of certain *Pinus pumila* thickets.

Its old Kamtchatka name was acc. to KITTLITZ loc. cit. »Eschelitsch».

Type of distribution: Circumpolar.

Geographical area: Europe: from Ireland, Scotland, Spitzbergen and Nova Zembla southwards to southern Sweden, Denmark, N. E. Germany, the Sudetes, Giant Mts., central Russia, in the Urals southwards to 53° N. lat. Asia: along the North Coast to Chukch Penins., southwards to northern Tomsk prov., northern Mongolia, De Castri Bay, Saghalin and Honshu. America: from the north coast of Alaska, King William Land and Labrador southwards to British Columbia and mts. of New Hampshire. Southernmost Greenland (on the W. coast to about 64° N. lat.). (Not known from Iceland.)

Rubus fruticosus.

PENNANT, Arct. Zool. (1784) p. CXV.

The plant must be excluded from the flora of Kamtchatka.

499. ***Rubus idaeus*** L., Sp. pl. ed. I (1753) p. 492.

subsp. ***sachalinensis*** (LÉVL.) n. comb. (FOCKE in Bibl. Bot. Heft 72: 2 p. 210 pro var.).

Rubus idaeus KRASCHENINN., Kamtsch. p. 101; PENNANT, Arct. Zool. (1784) p. CXV; PALLAS, Fl. Ross. I: 2 p. 64 quoad pl. Kamtsch.; KITTLITZ, Denkw. II, p. 321; LEDEB., Fl. Ross. II p. 65 quoad pl. Kamtsch.; KOM., Voy. Kamtch. p. 453. — *Rubus idaeus β strigosus* MAXIM. in Bull. Ac. Imp. Sc. St. Petersb. XVII (1872) p. 161 et Mél. Biol. VIII (1872) p. 394 saltem quoad pl. Kamtsch.; *Rubus strigosus* HULTÉN, Fl. Kamtch. I, p. 27. — [*Rubus sachalinensis* LÉVL. in FEDDE, Rep. Spec. Nov. VI (1909) p. 332.]

South Kamtchatka: Kurile Lake noted in A. 209; lower Ozernaja R. noted by HN; upper Unkanakchek R. noted in A. 198; near Sahach in *Alnus*-thickets noted by HN; upper Kusingen R. noted in A. 189; »Zolotoi Jarr» (Golygina R.) RUBINSKI 1909; Assatcha mts., S. E. slope noted in A. 187, A. 188; the Kohelok mt. in *Alnus*-thickets noted by HN; 10 km. S. E. of Bolsheredsk July 13th 1921 HN No. 2127; E. of Bolsheredsk noted by HN; near the hot springs at Siku R. KOMAROV 1908; upper (Paratunka-) Bystraja R. in *Alnus*-thickets noted by HN; Mt. »Gorachie Gora» (Paratunka valley) KOMAROV 1908; Bogatyrjovka PERFILJEV 1910 (Hb. Berol.); between Apatcha and Natchika noted in A. 120; Natchika Sept. 3rd 1921 HN No. 3016 (A. 116), do. on an open spot in the *Alnus* region noted by HN; Savoiko KOMAROV 1908, do. July 7th 1920 HN No. 273.

East Kamtchatka: Petropavlovsk PERFILJEV, do. July 21st 1920 HN No. 546, do. noted in A. 129 a, A. 130; Lake Assabatch Aug. 1926 MALAISE.

Central Kamtchatka: Malka KOMAROV 1909; Ganala KOMAROV 1909; the hot springs at Pushtchina KOMAROV 1909; Milkova KOMAROV 1909; between Mashura and Shtchapina KOMAROV 1909; Shtchapina July 17th 1921 HN No. 3448 (MALAISE).

West and North Kamtchatka: Tigil LEVITZKY, do. BEZAIS 1909.

»Kamtchatka»: STELLER acc. to PALLAS loc. cit., RASTARGUJEFF, STEWART, MERTENS.

Noted in the following association:

In *Alnus—Calamagrostis—Dryopteris* ass.:

Single (A. 120, A. 129 a, A. 130, A. 188, A. 198, A. 209); Sparse (A. 116, A. 189); Scattered (A. 187).

In South Kamtchatka this plant is fairly common in the lower *Alnus* region. It rarely forms large groups, but is usually occurring as single specimens or in small groups. It flowers in July.

From typical *R. idaeus* our plant differs *inter alia* in having glands on the peduncles. It is probably identical with *R. idaeus* var. *aculeatissimus* REGEL & TILING (Florul. Ajan. p. 87) but such specimens of that form as I have seen are more densely armed with bristles and have more densely glandular peduncles than our plant. Their new canes were cinereous-tomentulose and not glabrous, as sometimes stated. It also resembles *R. subarcticus* (GREENE) RYDB. (acc. to FERNALD in Rhodora 21, 1919 p. 96 identical with *R. idaeus* v. *canadensis* RICH.) of northern N. America, which, however, judging from the few specimens from Alaska that I have seen have the large bristles of the upper part provided with a gland in the end. This is not the case with our plant, which also usually has longer and narrower sepals than its American counterpart, that characteristic being, however, very variable. A comparison with a larger American material would perhaps prove that the Kamtchatka plant is identical with the American. From *R. strigosus* MICH. and *R. melanolasius* FOCKE, with which our plant has sometimes been identified, it differs in having the young stems, petioles and inflorescence tomentose or puberulent. Compare RYDBERG in N. Amer. Fl. 22: 5 p. 431 and FERNALD in Rhodora 21 (1919) p. 89—98.

Type of distribution: Circumpolar.

Geographical area: In several subspecies: Europe: from northern Scandinavia, southern Kola Penins. and northern Russia southwards to the Mediterranean Sea, Crimea and Caucasus (to the south in the mts.). Asia: at Obi from about 62° N. lat., from Verchojansk distr. and from middle Kolyma southwards to Semiretchensk prov., northern Mongolia, Corea and southern Japan. America: from Alaska to Labrador and Newfoundland southwards to Colorado and Virginia. In Europe subsp. *vulgatus* ARRHEN., in eastern Asia subsp. *sachalinensis* and perhaps others, in Japan subsp. *nipponicus* FOCKE,

in western N. Amer. acc. to RYDB. subsp. *melanotrachys* FOCKE and *melanolasius* FOCKE, in eastern N. Amer. acc. to RYDB. subsp. *strigosus* MICH. and in northern N. Amer. acc. to RYDB. subsp. *subarcticus* GREENE (= var. *canadensis* RICH.). Acc. to FERNALD var. *melanotrachys*, var. *melanolasius* (which he considers to be identical with var. *aculeatissimus* REGEL & TILING), var. *arizonicus*, var. *peramoenus*, and var. *acalyphaceus* are confined to western N. Amer., while var. *strigosus* and var. *canadensis* occur throughout the continent and var. *Egglestonii* and *heterolasius* are confined to eastern N. Amer.

Rubus saxatilis L.

MAXIM. in Bull. Ac. Imp. Sc. St. Petersb. 17 (1872) p. 148 et in Mél. Biol. VIII p. 375.

MAXIMOVICZ reports this species from Kamtchatka without mentioning the collector. It must be excluded from the flora of our area.

»**Rubus spectabilis** RUDOLPHI.»

A species reported by GEORGI (Beschreib. Nachtr. p. 274) to have been found in the Kamtchatka-collections of MERK. Perhaps *R. spectabilis* PURSH is meant, which MERK may have collected in America.

The species must be excluded from the flora of our area.

500. ***Rubus stellatus*** J. E. SMITH, Pl. Icon. Ined. III (1791) tab. 64.

LEDEB., Fl. Ross. II p. 71; FEDTSCH., Fl. Îl. Comm. p. 55.

East Kamtchatka: Klutchi KURTACHOF 1909 (Hb. Hort. Petrop. sub *R. arcticus*).

Commander Islands: Bering Island KJELLMAN, DYBOVSKY 1879, GREBNITZKY 1894 (very doubtful, possibly belonging to *R. arcticus*) and acc. to FEDTSCH. loc. cit. DOBROTVORSKY and STEJNEGER; Copper Island acc. to FEDTSCH. loc. cit. STEJNEGER and MOROZEVICZ.

»Kamtchatka»: CHORIS acc. to LEDEB. loc. cit.

In its typical form this plant is easily distinguished from *R. arcticus* or *R. acaulis*. It has larger flowers than either of these species and leaves more or less three-lobed. Owing to its short peduncles as well as to the large flowers, it resembles rather a large *R. acaulis* than *R. arcticus*. However, in some of the specimens from the Bering Island some of the leaves are three-lobed, while others are three-foliate, even with petiolated leaflets, and as neither the size of the flowers nor the prolonged sepals are very constant characteristics, the line of demarcation between *R. stellatus* and the other two does not seem clear. The material of *R. stellatus* and *R. acaulis* at my disposal is too small to enable me to form an opinion on this question. It must, however, be admitted that it would be strange if *R. arcticus* were not found on Commander Islands, when *R. stellatus* is common there. The specimen from Klutchi is of quite a typical form. *R. acaulis* × *stellatus* is reported from Alaska by RYDBERG in N. Amer. Fl. 22: 5 p. 437 but he mentions nothing

about *R. arcticus* × *acaulis* or *R. arcticus* × *stellatus*, both of which might be expected to exist there.

Type of distribution: Northern Pacific.

Geographical area: Asia: East Cape, eastern Kamtchatka, Commander Islands. America: Alaska and Yukon.

Fragaria vesca.

PENNANT, Arct. Zool. (1784) p. CXV.

The plant must be excluded from the flora of our area.

501. ***Potentilla anserina*** L., Sp. pl. ed. I (1753) p. 495.

Central Kamtchatka: The lower hot spring at Anauna R. Aug. 22nd 1926 MALAISE No. 162.

In its divided bractlets and silver-silky, lustrous leaves with long, narrow, acute teeth this specimen differs from all others of the *P. anserina* type that I have seen from our area and agrees with typical European *P. anserina*. Ripe achenes are unfortunately not present, but there can hardly be any doubt about the identity of the plant. Compare under *P. pacifica*. Whether it is indigenous or introduced within our area I cannot say.

Type of distribution: Cosmopolite.

Geographical area: Europe, except in the northernmost and southernmost parts; throughout Asia southwards to Persia, Kashmir and China. America: acc. to FERNALD from ?Alaska to Newfoundland. Also in South America (Chile) and Australia and Tasmania. In New Zealand the closely related *P. anserinoides* RAOUL.

Potentilla elegans CHAM. & SCHLECHT. in Linnaea II (1827) p. 22.

LEDEB., Fl. Ross. II p. 56; LEHMAN, Rev. Potentill. p. 162; WOLF, Monogr. Gatt. Potentill. p. 532.

The report of this species from Kamtchatka was based on specimens collected by REDOWSKY, who never reached our area. The species must be excluded from the flora of the Kamtchatka Peninsula.

Potentilla emarginata PURSH.

WOLF, Monogr. Gatt. Potentill. p. 533.

WOLF reports this species from »Nord-Kamtschatka» without mentioning the collector. The source of the report is unknown to me.

In Hb. Hort. Petrop. is preserved a specimen of this plant labelled »Kamtschatka ESCHSCHOLTZ». Probably Kamtchatka Province is meant and the specimen may have been collected on the Chukch Penins.

This high-arctic species could hardly be expected within our area.

502. ***Potentilla fragiformis*** WILLD. ex SCHLECHT. in Magaz. naturf. Freunde Berlin VII (1816) p. 294.

Wolf, Monogr. Gatt. Potentill. p. 509 (also var. *lucida* Willd. and var. *lucida* f. *nana*). — *Potentilla villosa* Ledeb., Fl. Ross. II p. 58 quoad pl. Kamtsch. ex herb. Willd; Cham. & Schlecht. in Linnaea II (1827) p. 22 quoad pl. Kamtsch. — ?*Potentilla nana* Fedtsch., Fl. Îl. Comm. p. 53.

South Kamtchatka: Bogatyrjovka July 16th 1920 Hn No. 459.

East Kamtchatka: Cape Izmennyi (near the entrance of Avatcha Bay) Savitch 1909 (without flowers but most probably belonging to this form).

Commander Islands: ?Morozevicz acc. to Fedtsch. loc. cit.

»Kamtchatka»: Willd. Herb. No. 9995 sub *Potentilla lucida* (probably not from Kamtchatka), Peters (*P. fragiformis* var. *lucida* det. Wolf), Rieder.

subsp. ***megalantha*** (Takeda) nov. comb.

Potentilla grandiflora Maxim. in Mél. Biol. IX (1873) p. 161 pro parte. — *Potentilla fragiformis* Miyabe, Fl. Kuril. p. 231; Yabe & Yendo, Fl. Shimushu p. (185). — *Potentilla megalantha* Takeda in Kew Bull. 25 (1911) p. 255; Kudo, Fl. Paramush. p. 122.

Northern Kuriles: Paramushir Kudo 1920; Shumshu Ishikawa 1894, Yendo 1903 acc. to Takeda loc. cit.

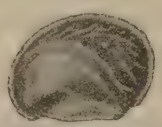


Fig. 7. Carpel of *Potentilla fragiformis* subsp. *megalantha* (a cultivated specimen in Hort. Berg.). Enlarged 10: 1.

South Kamtchatka: Cape Lopatka west coast June 17th 1920 Hn No. 12 a, do. June 24th 1920 Hn No. 133, do. east coast June 17th 1920 Hn No. 12 b; Toporkoff Island (Sarannaja Bay) Aug. 8th 1920 Hn No. 782.

The species flowers in the beginning of June. It seems hardly possible to retain Takeda's *P. megalantha* as a distinct species. According to Takeda loc. cit. it differs from *P. fragiformis* in the form of the leaves, the size of the flowers and the calyx at the time of floration, the form of the petals, the hairiness of the receptaculum of the stamens, number of stamens and in its possessing winged achenes. That at any rate the plant from Cape Lopatka belongs to *P. megalantha* Takeda can hardly be doubted, as it has the large flowers (3—4 cm. in diameter) of that plant and the form of the leaves illustrated by Takeda loc. cit. on p. 252, and as Takeda himself reports it from Shumshu Island, a few kilometres to the south of Cape Lopatka. The carpels of that plant have a more pronounced keel than is usually the case with *P. fragiformis*, but they are not winged as in Takeda's drawing. In a cultivated specimen in Hort. Bergianus obtained from Japan the keel was about $^1/_{10}$ of a millimetre on young carpels which were 2 mm. long; on ripe carpels it was somewhat broader. On a specimen in Hort. Bergianus the outer sepals were 6 mm. and the inner 10 mm. on a flowering specimen, while they were 13 and 16 mm. respectively on a fruit specimen. Thus in *P. mega-*

lantha as well as in *P. fragiformis* they increase considerably during the anthesis. The petals are somewhat more emarginate than in TAKEDA's drawing. The receptaculum of the stamens is — like the whole plant — more hairy than in the typical form, but the outer stamens are affixed to a nearly glabrous part of the receptaculum, while the inner are affixed to a very hairy part, quite as in typical *P. fragiformis*. The plant from Toporkoff Island is still more closely related to typical *P. fragiformis*, and the specimens from Bogatyrjovka have also the smaller flowers and the leaf-form of that plant. I cannot find any distinct line of demarcation between *P. megalantha* and *P. fragiformis* and I must therefore reduce the former to a geographical race or subspecies of the latter. It might be pointed out that several other species are represented on the Pacific shore by large-flowered forms more or less well differentiated from the corresponding continental plant.

Type of distribution: ?Asiatic Pacific.

Geographical area: Asia: from Chukch Penins. over Gishiga, Kamtchatka, Ochotsk and Saghalin to Yezo and Primorsk prov., acc. to KOM. in Mukden, prov., acc. to WOLF also in Central Siberia (Tarbagatai). America: the Aleutian Islands and islands in the Bering Sea. In Japan and southern Kamtchatka and on Saghalin subsp. *megalantha*.

503. ***Potentilla fruticosa*** L., Sp. pl. ed. I (1753) p. 495.

PENNANT, Arct. Zool. (1784) p. CXV; MERTENS, Bemerk. Fl. Koragins p. 63; LEDEB., Fl. Ross. II p. 61; DITMAR, Reisen I p. 397, Reisen II p. 94; YABE & YENDO, Fl. Shimushu p. (185); FEDTSCH, Fl. Îl. Comm. p. 54; WOLF, Monogr. Gatt. Potentill. p. 55; KUDO, Fl. Paramush. p. 122 (var. *tenuifolia*). — *Pentaphylloides fruticosa, elatior minus hirsuta* PALLAS in Stralsund. Mag. II (1768) p. 175 and V (1769) p. 429. — *Potentilla davurica* KOIDZ. Pl. Yokoyam. p. 213.

Northern Kuriles: Paramushir KUDO 1920 (var. *tenuifolia* acc. to KUDO loc. cit.); Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka June 19th 1920 HN No. 48; N. of Ozernaja village noted by HN; between Javina and Golygina RUBINSKI 1909; S. of Kidipalok R. noted by HN; upper Kusingen R. noted by HN; lower Golygina R. noted by HN; W. of Golygina village in heath noted by HN; upper Shadutka R. noted by HN; the divide between Savan and Shadutka R. noted in heath by HN; middle Opala R. July 27th 1920 HN No. 2438; near the hot spring at upper Opala R. in heath noted by HN; upper Abshen R. noted by HN; Tarja Bay KOMAROV 1908; Lake Blishne noted by HN; Nikolajevsk KOMAROV 1908; Savoiko KOMAROV 1908.

East Kamtchatka: Petropavlovsk STEWART, do. MERTENS; between Petropavlovsk and Savoiko July 5th 1920 HN No. 217; between Petropavlovsk and Avatcha volcano noted in A. 21; the Kronoki Pass Aug. 30th 1921 HN No. 3526 (MALAISE); Lake Kronoki Sept. 4th 1921 HN No. 3565; Klutchevskaja volcano 3600 feet BEZAIS 1908.

Commander Islands: Bering Island reported by STELLER only.

Central Kamtchatka: Ganala STEWART, do. PROTOPOPOF 1908; Shtchapina KOMAROV 1909; Tolbatchik GRINOP 1909, do. KOMAROV 1909; Anauna R. Aug. 19th 1926 MALAISE No. 158; Klutchi AFANASEJEV 1909.

West and North Kamtchatka: Vorovskaja RUBINSKI 1908; Uka YOKOYAMA; Pallan SAVTCHENKO 1911; Karaginsk Island MERTENS (var. *tenuifolia*), do. LOGINOVSKI 1910.

»Kamtchatka»: ESCHSCHOLTZ acc. to LEDEB. loc. cit., STEWART, KUSMISCHEFF, MERTENS (Hb. Holm.), KITTLITZ, LIBOSCHITZ, RIEDER 1831 (Hb. Holm.)

Noted in the following association:

In *Carex—Myrica* ass.:
Single (A. 21).

In South Kamtchatka *P. fruticosa* is not rare in the wet *Myrica* associations or *Carex—Sphagnum* association, sometimes also occurring in the heaths. It flowers from the beginning of July to the beginning of September.

The Kamtchatka plants usually belong to the head form (var. *vulgaris* WILLD.), specimens with somewhat narrower leaves (var. *tenuifolia* LEHM.) being sometimes met with.

The Kamtchatka name of our plant is »Kurilski tchai» (=Kurile tea).

Type of distribution: Circumpolar.

Geographical area: Europe: Ireland, northern England, southern Sweden (the isle of Öland), Courland, Estonia, the Pyrenees, Alpes maritimes, the Caucasus, the Urals (Vologda, Perm and Orenberg provinces). Asia: at Yenisei from about 67° N. lat., from middle Kolyma R. and Chukch Penins. southwards to Armenia, Persia, the Himalayas, northern China and Honshu (to the south in the mts.). America: from the north coast of Alaska to Labrador, southwards to California, New Mexico, northern Iowa and Pennsylvania.

504. ***Potentilla multifida*** L., Sp. pl. ed. I (1753) p. 496.

Central Kamtchatka: Kosyrevsk July 9th 1921 HN No. 3424 (MALAISE); Klutchi BEZAIS 1908, do. AFANASEJEV 1909.

West and North Kamtchatka: Sedanka BEZAIS 1909.

It seems difficult to decide whether this species is indigenous or introduced within our area. The specimens belong to a low creeping form with comparatively narrow acute lobes of the leaves and the outer sepals considerably shorter than the inner. The leaves are white-tomentose underneath with long silky hairs on the veins.

Type of distribution: ?Circumpolar.

Geographical area: Europe: one locality on Spitzbergen, some few localities in northern Sweden, on Kola Penins. and in the Urals (Orenburg), also in the Alps and in Caucasus. Asia: at Yenisei from about 66° N. lat., from Vilju, Jakutsk and Ajan districts southwards to Persia, Kashmir,

the Himalayas, northern China and Corea. Also in central and northern Kamtchatka. America: subarctic America west to Great Slave Lake acc. to RYDBERG in N. Amer. Fl.

505. ***Potentilla nivea*** L., Sp. pl. ed. I (1753) p. 499.

CHAM. & SCHLECHT. in Linnaea II (1827) p. 21 (var. 3 *Camtschatica*); LEDEB., Fl. Ross. II p. 57 (β *macrantha*); LEHM., Rev. Potentill. p. 165 (γ *macrantha*); WOLF, Monogr. Gatt. Potentill. p. 233 (var. *macrantha*).



Fig. 8. Leaves of: a, b *Potentilla nivea;* c, d *Potentilla uniflora* var. *ampla* (c HN No. 574, d HN No. 2320); e, f *Potentilla uniflora* (e MALAISE No. 161, f MALAISE No. 157). Natural size.

South Kamtchatka: Sources of Poperochnaja R. KOMAROV 1908.

Central Kamtchatka: Sources of Kachkan R. (Pushtchina) KOMAROV 1909; Tolbatchik KOMAROV 1909 (Hb. Berol.), do. July 29th 1927 P. T. NOVOGRABLENOF.

West and North Kamtchatka: Pallan July 1926 I. V. LONGINOFF; Karaginsk Island MERTENS, do. POSTELS.

»Kamtchatka»: The above-quoted reports in literature of var. *camtschatica* CHAM. & SCHLECHT. (= var. *macrantha* LEDEB.) are all based on a specimen collected by REDOWSKY who, however, never visited our area.

During my journeys in South Kamtchatka I never saw this plant, which seems to have a northern distribution within our area.

The specimens agree fairly well with the drawing of *P. macrantha* in LEDEB. Icon. fl. Ross. II tab. 133 (cfr. fig. 7 a, b) but the flowers are not larger than 15 mm. in diameter, whereas WOLF loc. cit. considers var. *macrantha* to be characterized by flowers 15—20 mm. in diameter. Besides this there is another plant of *P. nivea*-type that exists within our area, but as I have not seen specimens connecting those two very different groups I take them to be separate species. Compare under *P. uniflora*.

Type of distribution: Circumpolar, arctic-alpine.

Geographical area: In several forms: Europe: Spitzbergen, Nova Zembla, mts. of Scandinavia and Kola Penins., the Urals, the high Alps, Caucasus. Asia: along the North Coast to Chukch Penins., southwards in the mts. to Pamir, the Himalayas, Mongolia, Transbaikalia, some few localities in Amur prov., Ajan, Kamtchatka and Japan. America: from the north coast of Alaska to Baffin Land and Labrador, southwards in the mts. to Colorado (39° N. lat.) and Gaspé Penins. (48° N. lat.). Greenland, except southern part.

506. ***Potentilla norvegica*** L., Sp. pl. ed. I (1753) p. 492.

LEDEB., Fl. Ross. II p. 36; LEHM., Rev. Potentill. p. 198; WOLF, Monogr. Gatt. Potentill. p. 401.

South Kamtchatka: Bolsheredsk RIEDER 1831, do. Aug. 22nd 1921 HN No. 2904; Apatcha village noted by HN; Tarja Bay PERFILJEF 1910; Nikolajevsk KOMAROV 1908; Natchika village noted by HN; Korjaka village noted by HN; Savoiko July 14th 1928 W. EYERDAM.

East Kamtchatka: Petropavlovsk MERTENS, do. WRIGHT 1853—56, do. Aug. 17th 1920 HN No. 920; between Petropavlovsk and Savoiko July 9th 1920 HN No. 388 c; Lake Kronoki KOMAROV 1909; Ustj-Kamtchatsk July 5th 1925 MALAISE No. 474.

Central Kamtchatka: Malka STEWART, do. STUBENDORFF 1849; Mashura KOMAROV 1909; Klutchi Okt. 17th 1925 MALAISE No. 472.

West and North Kamtchatka: Tigil BEZAIS 1909.

»Kamtchatka»: KASTALSKY, KUSMISCHEFF, VOSSNESENSKY, DYBOVSKY.

This plant is only found in the neighbourhood of human habitations or in places frequently visited by man. It is hardly indigenous within our area. It flowers from the beginning of June to the end of August. Most of the specimens belong to the Eurasiatic type (var. *genuina* WOLF) but some (for instance, MALAISE No. 474) have the broad obtuse leaflets and broad teeth of the American type (var. *hirsuta* TORR. & GRAY). The differences between these two types, however, seem to be very little pronounced.

Type of distribution: Circumpolar.

Geographical area: Europe: from northern Scandinavia, northern Finland and Russia southwards to northern Switzerland. Austria and central Russia (only occasionally in S. E. Europe, France and England). Asia: from the mouth of Obi R., at Yenisei from about 62° N. lat. from Verchojansk and

Kolyma districts and northern Kamtchatka southwards to Akmolinsk prov., Semipalatinsk prov., Irkutsk prov., Ussuri and Yezo. America: (var. *hirsuta* = *P. monspeliensis* L.) from Alaska to Labrador and Newfoundland, southwards to New Mexico, Kansas and D. C.

507. ***Potentilla pacifica*** Howell, Fl. N. W. Amer. I (1898) p. 179.

Potentilla anserina Cham. & Schlecht. in Linnaea II (1827) p. 24 quoad pl. Kamtsch.; Hook. & Arnott in Beechy's Voy. p. 113; Ledeb., Fl. Ross. II p. 44 quoad pl. Kamtsch.; Yabe & Yendo, Fl. Shimushu p. (185); Fedtsch., Fl. Îl. Comm. p. 53; Wolf, Monogr. Gatt. Potentill. p. 669 (var. *grandis*, var. *groenlandica*) quoad pl. Kamtsch.; Kudo, Fl. Paramush. p. 121.

Northern Kuriles: Paramushir Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka, west coast June 22nd 1920 Hn No. 122 (glabrous form); near the mouth of Bolshaja R. Komarov 1908, do. Rubinski 1909, do. noted by Hn; Paratunka Stubendorff; Avatcha Bay acc. to Hook. & Arnott. loc. cit.

East Kamtchatka: Petropavlovsk Mertens, do. Komarov 1908, do. Aug. 17th 1920 Hn No. 918 and 919 (glabrous form), do. June 27th 1921 P. T. Novograblenof, (glabrous form), do. June 19th 1922 P. T. Novograblenof, the mouth of Korenevskaja R. Komarov 1909; Ustj Kamtchatsk July 1925 Malaise N. 473.

Commander Island: Bering Island Kjellman and acc. to Fedtsch. loc. cit. Steller, Dybovsky, Stejneger, Grebnitsky; Copper Island acc. to Fedtsch. loc. cit. Stejneger and Morozevicz.

West and North Kamtchatka: The shore at Kompakovaja Zelenin 1908.

»Kamtchatka»: »Hb. Chamisso», Eschscholtz, Rastargujeff, Stewart, Kastalsky, Kusmischeff, Mertens, Rieder 1831 (Hb. Holm).

In Kamtchatka this species seems to be practically confined to the seashore. It flowers from the middle of June to the end of August.

Although *Potentilla anserina* sens. lat. has recently been treated monographically by several authors (Rydberg, Monogr. N. Amer. Potentill. and in N. Amer. Fl.; Wolf, Monogr. Gen. Potentill.; Fernald in Rhodora II, 1909 p. 1—9), it is still a comparatively unclear group. The European typical *P. anserina* is characterized by dorsally sulcated, thick-ovoid achenes, toothed or divided bractlets, stems, petioles and stolones usually pubescent, and leaves silver-silky, usually lustrous underneath, with long, narrow, sharp-pointed teeth. Our plant differs from that type in having the achenes rounded on the back without, or with only a very slight trace of, a groove in the broader end, entire bractlets and leaves glabrous or white-tomentose, not lustrous underneath, with broader, more triangular teeth. In particular, the difference in the form of the achenes pointed out by Rydberg seems to me so important

that it is best to regard the plant as a separate species, all the more so as it seems to occupy a large geographical area of its own. FERNALD, who, loc. cit., gives a critical review of the opinions of RYDBERG and WOLF, divides the group with non-sulcate achenes into two species, viz. — *P. pacifica* HOWELL, characterized by »Calyx and lower surfaces of the interruptedly pinnate leaves white tomentose» and *P. Egedii* WORMSK., characterized by »Calyx and lower surfaces of the simply pinnate leaves glabrous or glabrate».

It seems impossible to divide the material into distinct groups on the basis of these characteristics only. Specimens are sometimes found with the younger leaves white tomentose, but the older ones quite glabrous, and in the Kamtchatka material there are glabrous specimens with strongly interruptedly pinnate leaves. Glabrous seashore forms of both *P. anserina* and *P. pacifica* apparently exist and this characteristic cannot therefore be used in the taxonomy of the group. Again, the second characteristic of *P. Egedii* as given by FERNALD — the »simply pinnate» leaves — is not constant. Moreover, in the most pronounced specimens of that plant from Greenland traces can be found of the small leaflets that alternate with the large ones in typical *P. anserina* as well as in *P. pacifica*, but they are usually fewer and smaller in small specimens. It may be concluded from this reasoning that our plant should not be called *P. pacifica* but *P. Egedii*, which is the earlier of the two names, but I hesitate to make this identification as I have seen only one or two specimens of the Greenland *P. Egedii* with ripe achenes. These were more flattened laterally, and slightly keeled, and as, furthermore, the leaflets are more rounded with less sharp teeth, it may still be a form worthy to rank as a separate species. The taxonomy of this group is rendered more difficult by the fact that ripe achenes are only rarely found in herbarium specimens.

Type of distribution: American, transgressing into Eastern Asia.

Geographical area: Asia (area uncertain): at least from Ochotsk, Ussuri, Japan, Kamtchatka and Commander Islands. America: acc. to FERNALD from Alaska (60° N. lat.) to California (34° N. lat.) and from Labrador (58° N. lat.) to New York (41° N. lat.). Acc. to FERNALD also in (W.) Greenland.

508. ***Potentilla palustris*** (L.) SCOP., Fl. Carn. I. ed. 2 (1772) p. 359.

YABE & YENDO, Fl. Shimushu p. (185); FERNALD & LONG in Rhodora 16 (1914) p. 10 (var. *parvifolia*). — »*Potentilla Comarum* SCOP., *Comarum palustre* L.» ERMAN, Verzeichn. p. 63. — *Comarum palustre* [L., Sp. pl. ed. I (1753) p. 502]; LEDEB., Fl. Ross. II p. 62; FEDTSCH., Fl. Îl. Comm. p. 55; KOM., Voy. Kamtsch. p. 454; KUDO, Fl. Paramush. p. 121.

Northern Kuriles: Paramushir C. TARO 1892 acc. to KUDO loc. cit., KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Kurile Lake noted by HN; Javina noted by HN; N. of Javina village noted by HN; middle Kusingen R. noted by HN; Golygina village noted by HN; middle Ksudach R. noted by HN; Topik noted by HN; Opala R. 30 verst from the mouth RUBINSKI 1909; the mouth of Artem-

jeva R. noted in A. 221; the mouth of Stegnova R. noted in A. 219; Akhomten Bay 250 m. Sept. 11th 1920 Hn No. 1313; the mouth of Bolshaja R. noted in A. 47; the Kohelok mt. 610 m. noted by Hn; Bolsheredsk Vossnesensky 1847; Apatcha noted by Hn; Paratunka Stubendorff; small lake between Apatcha and Natchika noted by Hn; near the divide at the Shalsan Pass noted by Hn; the hot spring at Natchika July 1848 Vossnesensky; Poperochnaja R. Komarov 1908.

East Kamtchatka: Petropavlovsk Aug. 16th 1920 Hn No. 883; Kalashtyrka Perfiljef 1910; between Petropavlovsk and Savoiko July 9th 1920 Hn No. 388 b; Nishne Kamtchatsk Vossnesensky 1846.

Commander Islands: Bering Island Grebnitzky 1894, Stejneger (acc. to Fernald & Long loc. cit. var. *parvifolia*), Dybovsky and Morozevicz acc. to Fedtsch. loc. cit., Gudzenko 1910; Copper Island Dybovsky 1879, Stejneger acc. to Fedtsch. loc. cit.

Central Kamtchatka: Between Malka and Ganala acc. to Kom. loc. cit.; between Pushtchina and Sharomsk Komarov 1909; below Mashura Protopopof 1909; Ushki Rubinski 1908; Lake Kurarotchoje Bezais 1908.

West and North Kamtchatka: Krutugorovaja Zelenin 1908; Tigil Levitzky; Pallan Savtchenko.

»Kamtchatka»: Rastargujeff, Stewart, Kastalsky, Mertens, Rieder 1831.

Noted in the following associations:

In *Carex—Sphagnum* ass.:
Single (A. 47).

In *Carex—Sanguisorba*—Moss ass.:
Single (A. 221); Scattered (A. 219).

In South Kamtchatka this plant is fairly common in the lowlands in bogs and wet meadows.

The Kamtchatka plant agrees fairly well with the Scandinavian. The pedicels are glandular but the upper part of the stem usually only pilose, while Scandinavian specimens are usually glandular there as well. The leaves are nearly glabrous above but pilose beneath, at any rate on the nerves and in the margin. In Rhodora 16 (1914) p. 5—11 Fernald & Long give a review of the American forms of our species wherein they quote their Western American var. *parvifolia* for Bering Island. One would therefore expect that the Kamtchatka plant belonged to that variety, which, however, is apparently not the case. The picture of the leaves of typical *P. palustris* given by Fernald & Long loc. cit. in Pl. 106 fig. 1 (from Svensk Botanik Pl. 310) is unfortunately not in close agreement with Scandinavian specimens of the plant, which very rarely have such acute leaves. They far more resemble on an average Fernald & Long's fig. 4. Arctic specimens have usually shorter leaves, corresponding to Fernald & Long's fig. 3. A review of the variation of the

hairiness in the Scandinavian plant is given by GUNNARSON in Bot. Not. 1914 p. 217—224.

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland, northernmost Scandinavia, Kola and Nova Zembla southwards to Spain, Italy, Bulgaria and Caucasus (rare to the south). Asia: throughout Siberia from the mouth of Yenisei and Lena rivers to Kolyma and Chukch Penins. southwards to Transcaucasia, Transcaspia, Akmolinsk prov., northern Mongolia, Manchuria and Honshu. America: from Alaska to Labrador, southwards to California, Wyoming, Minnesota and Pennsylvania. Southern Greenland.

509. ***Potentilla stolonifera*** LEHM. in Delect. sem. hort. Hamburg bot. 1831 No. 5 (nomen solum) et LEDEB., Fl. Ross. II (1846) p. 38.

LEHM., Rev. Potentill. p. 44 tab. 15; LEDEB., Fl. Ross. II p. 38. — *Potentilla fragarioides* CHAM. & SCHLECHT. in Linnaea II (1827) p. 25; HOOK. & ARNOTT in Beechy's Voy. p. 113. — *Potentilla fragarioides β flagellaris* LEHM., Rev. Potentill. p. 43; MAXIM. in Mél. Biol. IX (1873) p. 159. — *Potentilla fragarioides* var. *δ Sprengeliana* MAXIM. in Mél. Biol. IX (1873) p. 160 saltem quoad pl. Kamtsch.; FEDTSCH., Fl. Îl. Comm. p. 52. — *Potentilla fragarioides* var. *ε stolonifera* MAXIM. in Mél. Biol. IX (1873) p. 160; YABE & YENDO, Fl. Shimushu p. (185); FEDTSCH., Fl. Îl. Comm. p. 53; WOLF, Monogr. Gatt. Potentill. p. 639; KUDO, Fl. Paramush, p. 122.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Lower Ozernaja R. Aug. 13th 1921 HN No. 2858 b (A. 100); the hot springs at upper Unkanakchek R. on hot earth noted by HN; the hot springs at Savan R. July 31st 1921 HN No. 2522; near the mouth of Bolshaja R. noted by HN; middle Karymchina R. noted in meadow by HN; the hot spring at upper Karymchina R. 400 m. at warm ground Sept. 11th 1921 HN No. 3089; Bolsheredsk noted by HN; the hot spring at Siku R. Sept. 5th 1921 HN No. 3054 (A. 122); Apatcha village June 19th 1922 HN No. 3823; lower Bannaja R. noted in meadow and *Angelica ursina* meadow by HN; between Shalsan and Apatcha VOSSNESENSKY 1847; the hot springs at Bannaja R. RUBINSKI 1909, do. Sept. 12th 1921 HN No. 3226; the hot spring »Malenki Klutchik» Bannaja 375 m. Sept. 12th 1921 HN No. 3151; Paratunka KOMAROV 1908; Tarja Bay SAVITCH 1909; Toporkoff island (= Starichkoff Island) Sarannaja Bay PERFILJEF 1911; Nikolajevsk KOMAROV 1908 (Hb. Berol.); Avatcha Bay acc. to HOOK. & ARNOTT loc. cit.

East Kamtchatka: The entrance of Avatcha Bay PERFILJEF 1911; Petropavlovsk CHAMISSO »*P. fragarioides* L. ad Portum Petro Pauli Kamtschatca *Potentilla stolonifera* LEHM., Cat. Sem. 1831 teste LEHMAN» (Hb. Berol.), do. MERTENS, do. LÜTKE, do. KOMAROV 1908, do. RUBINSKI 1908, do. PERFILJEF 1910, do. July 21st 1920 HN No. 540, do. Aug. 14th 1920 HN No. 872, do. June 1st 1921 HN No. 1603, do. June 14th 1921 HN No. 1691, do. Okt. 16th 1924 MALAISE; between Petropavlovsk and Savoiko July 9th 1920 HN No.

388 a; Avatcha volcano 900 m. July 30th 1920 Hn No. 573, do. 1100 m. noted by Hn; Uzon crater Komarov 1909; Ustj-Kamtchatsk Bezais 1908 (Hb. Berol., Hb. Holm.), do. July 1925 Malaise No. 471.

Commander Island: Bering Island Kjellman, Dybovsky 1879, Grebnitzky 1894.

Central Kamtchatka: Malka Komarov 1909; between Sharomsk and Vershne Kamtchatsk Grinop 1909; Kirganik (from the school herbarium of Kirganik); Anauna R. Sept. 2nd 1926 Malaise No. 160; Klutchi Zelenin 1908, do. Afanasejev 1909, do. Protopopof 1909, do. May 30th 1921 Hn No. 3300 (Malaise).

West and North Kamtchatka: Tigil Levitzky; Karaginsk Island Mertens.

»Kamtchatka»: Eschscholtz (sub *S. Sprengeliana* Lehm. Hb. Ledeb.), Choris, Kastalsky, Postels, Peters 1831, Rieder 1833, Dybovsky 1879.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 100).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 122).

In South Kamtchatka this species is fairly common, occurring from sea-level almost up to the limit of vegetation. It sometimes occurs in the meadows of the lowlands but is more common on crests in the mountains where the snow blows away in the winter. On such a locality on Mt. Meshennyi near Petropavlovsk its large green leaves had already developed by March 30th 1921. It also occurs in another very characteristic locality, viz. on the hot ground in the neighbourhood of the hot springs. On such hot spots the snow melts away as soon as it has fallen and the conditions in the winter apparently somewhat resemble those of the snowless crests in the mountains. *P. stolonifera* is a very characteristic spring plant in Kamtchatka; it flowers from the end of May to the end of July. At the Riksmuseum, Stockholm, where the plant is now cultivated, it also flowers at the end of May.

Wolf, and with him most later authors, regard our plant as a variety of *P. fragarioides* L. From this species it differs in twice as large flowers (20—25 mm. in diameter); usually broader and more rounded leaflets, stolones developed on the flowering plant, fewer flowers (1—3, rarely 4, on each flowering stem) and usually larger bractlets. To this may be added that all ripe achenes of the Kamtchatka plant that I have seen were provided with irregular, strongly raised lists, while all specimens of *P. fragarioides* that I have seen from inner Siberia had the achenes smooth or provided with inconspicously raised lists. Krylof in his Fl. Altaia I p. 377 describes the achenes of *P. fragarioides* as being provided with »transverse not raised nerves». The styles of *P. stolonifera* always fall away before the ripening of the achenes,

whereas they seem to be more persistent in *P. fragarioides*. The hairiness of our plant varies considerably. On the above grounds, and as our plant occupies a geographical area of its own, it seems to me necessary to regard it as a separate species. The spring forms of the plant with its thick runners, short 1—2 flowered scapes and vivid-green leaves, at first sight differ somewhat from the autumn forms, with their thin or quite withered runners, brownish leaves and grown-out scapes. No doubt such specimens in different stages of development caused the authors dealing with this plant to regard them as different varieties.

Type of distribution: Asiatic Pacific.

Geographical area: Kamtchatka and Commander Islands, southwards to Saghalin, southern Japan and Corea. *P. fragarioides* from the Urals eastwards to the Pacific Ocean.

510. ***Potentilla uniflora*** LEDEB. in Mém. Ac. Imp. Sc. St. Petersb. V (1812) p. 543.

East Kamtchatka: Cape Kozlof June 20th—30th 1923 MALAISE; Klutchevskaja volcano 3500 feet KOZLOVSKI 1909.

Central Kamtchatka: Anauna R. Aug. 18th 1926 MALAISE No. 157, do. Sept. 5th 1926 MALAISE No. 161.

var. ***ampla*** nov. var.

Statura altiore, inflorescentia magis multiflora, ramis longioribus a typo differt.

South Kamtchatka: Shadutka volcano 1260 m. noted by HN; Opala volcano 1040 m. July 21st 1920 HN No. 2320; Glinini Mts RUBINSKI 1909; Shalsan July 26th 1848 VOSSNESENSKY; Grishkinoj R., Lake Natchika KOMAROV 1908; the Natchika mts. DYBOVSKY 1879; upper Poperochnaja R., the Korjatskaja valley SAVITCH 1908 (close to the head-form).

East Kamtchatka: Avatcha volcano, Mt. Sarai PERFILJEF 1911 (Hb. Berol.), do. 900 m. July 30th 1920 HN No. 574; Ploskaja volcano PROTOPOPOF 1909.

Central Kamtchatka: the foot of Korjatskaja volcano KOMAROV 1908; the Ganala mts. July 18th 1927 P. T. NOVOGRABLENOF, Kunchekla PROTOPOPOF 1909; Anauna R. Aug. 19th 1926 MALAISE No. 156; Klutchi AFANASEJEV 1909.

West and North Kamtchatka: Tigil RIEDER (a somewhat doubtful form det. WOLF to *P. nivea* var. *macrantha*); Karaginsk Island LOGINOVSKI 1910.

This plant is certainly closely related to *P. nivea*, but as I did not see intermediate forms between the two types I take them preliminarily as separate species. *P. uniflora* differs from *P. nivea* in the characteristic form and venation of the leaves (fig. 7 c—f), which have some few long scattered soft

hairs on the upper side and a tomentum, as well as long soft hairs on the under side, at least on young leaves. The petioles are not at all or only very slightly tomentose, but usually long hairy. The hairs on the calyx are thinner and softer than in *P. nivea*, and the flowers are larger. In America the plant is said to be 1—3-flowered, which is also sometimes the case in Kamtchatka, but most of the specimens have rich-flowered lax cymes and thus constitute a separate race. All intermediate forms between the one-flowered and the multiflowered type are to be found.

Some specimens agree closely with the figure given by RYDBERG (Monogr. N. Amer. Potentill. 2 pl. 35 fig. 3—7) which WOLF considers to be good, and it seems to me hardly doubtful that such specimens are identical with the North American plant going by that name. It is somewhat doubtful, however, if it is identical with *P. uniflora* LEDEB., as that species was originally described from Dahuria where our plant could hardly be expected to occur. LEDEBOUR in Fl. Ross. curiously enough reduces his species to a variety of *P. villosa*, which has somewhat similiar leaf-forms, there mentioning nothing about its occurrence in Dahuria but only reporting it from St. Lawrence Bay. Until these two specimens of LEDEBOUR's are revised the identity of *P. uniflora* LEDEB. cannot be established with any certainty.

Type of distribution: ? Eastern Asiatic—Western American.

Geographical area: Asia: Kamtchatka, acc. to WOLF Chukch Penins., ? Dahuria. America: from Alaska (Nome) to Alberta, southwards to Oregon and Colorado. RYDBERG reports the plant from Greenland — possibly a specimen of the sometimes very similiar *P. Vahliana* may have caused this report.

511. ***Potentilla villosa*** PALLAS ex PURSH, Fl. Amer. sept. I (1814) p. 353.

FEDTSCH., Fl. Îl. Comm. p. 54 (also var. *uniflora*).

Commander Islands: Bering Island KJELLMAN, DYBOVSKY, GREBNITZKY, acc. to FEDTSCH. loc. cit. STEJNEGER, Aug. 18th 1921 SANDBERG (Hb. Holm.); Copper Island DOBROTVORSKY 1881 and acc. to FEDTSCH. loc. cit. GREBNITZKY, STEJNEGER and MOROZEVICZ.

»Kamtchatka»: »Petropavlowsk MERTENS». The specimen is most probably erroneously labelled, as are apparently several others labelled in this way; Collector unknown, »Reliq. FISCHER» det. WOLF »Videtur (sine floribus) *Pot. Wahliana* LEHM.», this specimen very probably belongs to our species.

The species differs from *P. fragiformis* in possessing short styles and dark-green, strongly ribbed leaves, with a real tomentum on the underside.

Type of distribution: Eastern Asiatic—Western American.

Geographical area: Asia: only known to me with certainty from Chukch Penins. (Pitlekaj, St. Lawrence Bay, Conyam Bay leg. KJELLMAN) and Commander Islands. America: Islands in the Bering Sea, the Aleutian Islands, Alaska and acc. to RYDB. southwards to Washington.

Potentilla villosa β gracilis HOOK. & ARNOTT in Beechy's Voy. p. 113.

LEDEB., Fl. Ross. II p. 58. — *Potentilla villosa β gracilior* LEHM., Rev. Pot. p. 171; WOLF, Monogr. Gatt. Potentilla p. 245.

To judge from the description of this variety given by HOOK. & ARNOTT, it cannot belong to *P. villosa*. To which species it should be referred I do not know. It might be a small form of *P. fragiformis*, which is the only related species growing on the shores of Avatcha Bay — the place from which our plant was reported.

512. ***Sibbaldia procumbens*** L., Sp. pl. ed. I (1753) p. 284.

FEDTSCH., Fl. Îl. Comm. p. 52.

South Kamtchatka: Cape Lopatka RIEDER 1831 (»*Alchemilla arvensis, Alchemilla Aphanes.* Heufig auf der Lopatka, selten gegen Norden»), do. east coast June 22nd 1920 HN No. 103; W. of Sholtovskaja volcano noted in A. 206; sources of Kidipalok R. noted by HN; Assatcha mts. 650 m. noted by HN; Akhomten Bay 250 m. Sept. 11th 1920 HN No. 1306; Gorelaja volcano 600 m. noted by HN; Opala volcano 1100 m. July 23rd 1921 HN No. 2381; the Kohelok Pass 750 m. noted by HN; Mt. Stoll between Apatcha and Natchika noted by HN; Lake Natchika KOMAROV 1908; Shalsan KOMAROV 1908; sources of Poperochnaja R. KOMAROV 1908; Mt. Palovinaja Aug. 1st 1928 W. EYERDAM.

East Kamtchatka: Avatcha volcano 675 m. Aug. 4th 1920 HN No. 740; the foot of Kishpinitch volcano KOMAROV 1909; Mt. Krasheninnikof KOMAROV 1908; the Kronoki Pass KOMAROV 1909; Klutchevskaja volcano Aug. 5th 1927 MALAISE No. 624.

Commander Islands: Bering Island KJELLMAN, DYBOVSKY and acc. to FEDTSCH. loc. cit. STEJNEGER and GREBNITZKY; Copper Island acc. to FEDTSCH. loc. cit. STEJNEGER, GREBNITZKY and MOROZEVICZ.

Central Kamtchatka: Ganala KOMAROV 1909; Anauna R. Aug. 19th 1926 MALAISE No. 149, do. Sept. 5th 1926 MALAISE No. 150.

»Kamtchatka»: PETERS.

This plant is not rare in the alpine region of South Kamtchatka up to near the limit of vegetation.

The specimens agree well with the Scandinavian. The upper side of the leaves is sometimes comparatively strongly hairy (for instance in the specimens from Cape Lopatka), though sometimes only provided with scattered hairs (for instance HN No. 740). In sheltered localities the plant attains a height of up to 10 cm., but in more open localities it is as low-grown as arctic specimens. I can see no reason for the view — held by ASCHERSON & GRAEBNER in Synops. Mitteleur. Fl. VI: 1 p. 662 — that the Asiatic plant belongs to a separate species (*S. parviflora* WILLD.).

Type of distribution: Circumpolar, arctic-alpine.

Geographical area: Europe: Iceland, mts. of Scandinavia, Kola penins., Kolgujef(!), the central Urals (northern Perm prov.), Faroe Islands, mts. of the British Isles, the Pyrenees, mts. of Spain, the Vosges (rare), the Alps, mts. of Italy. Asia: Altai, Sajan Mts., southern Irkutsk prov., mts. of Semipalatinsk prov., Semiretchensk prov., Tibet and Mongolia, the Himalayas. Uncertain in eastern Siberia but occurring again in Chukch Penins. (Pitlekaj!), Kamtchatka and Honshu, also reported from Formosa. America: from Alaska (60° N. lat.) to Labrador (59° N. lat.) southwards to California (36° N. lat.), Colorado and New Hampshire (44° N. lat.). (Not in the region about the Great Lakes.) W. Greenland N. to about 74° N. lat., E. Greenland to Scoresby Sound.

513. ***Geum glaciale*** Adams ap. Fisch. in Mém. Soc. Nat. Mosc. II (1809) p. 187 tab. 11 fig. 20.

South Kamtchatka: On a mountain at »Galligin» (= Golygina) Rieder 1833 (sub *G. nivale*); Shadutka volcano 1125 m. Aug. 2nd 1921 Hn No. 2581.

East Kamtchatka: Klutchevskaja volcano Aug. 5th 1927 Malaise No. 626.

Central Kamtchatka: Kunchekla Protopopof 1909.

»Kamtchatka»: Collector unknown »*G. anemonoides* e Kamtschatka Ledebour» (Hb. Berol.); »In Kamtschatka legit, dt. am. Tilesius Petrop. 13.»

The plant is apparently rare in Kamtchatka, occurring in high-alpine localities only. Specimens collected in the beginning of August had finished flowering.

Type of distribution: Asiatic—Western American.

Geographical area: Asia: from the mouth of Yenisei R. eastwards along the coast to Chukch Penins., also in Kamtchatka. America: Alaska eastwards along the arctic coast to about Mackenzie R.

514. ***Geum macrophyllum*** Willd., Enumer. Plant. Hort. Berol. I (1809) p. 557.

Hook. & Arnott in Beechy's Voy p. 113 (excl. syn.); Ledeb., Fl. Ross. II p. 22; Fedtsch., Fl. Îl. Comm. p. 51; Sér. in DC., Prodr. 2 p. 550. — *Geum japonicum* Scheutz, Prodr. Monogr. Georum p. 31 saltem quoad pl. Amer. et Kamtsch.

South Kamtchatka: Kurile Lake Aug. 28th 1922 Hn No. 4433; lower Ozernaja R. Aug. 12th 1921 Hn No. 2820 (A. 97); lower Kusetenek R. noted in A. 195; upper Ksudach R. in *Filipendula* thickets noted by Hn; middle Tolmachovaja R. noted by Hn; upper Udoshk R. in *Filipendula* thickets noted by Hn; the mouth of Balaganchik R. noted in A. 155; lower Bolshaja R. noted in A. 112; near the mouth of Ipelka R. noted by Hn; lower Danilina R. noted in A. 61; near Haikovaja village in *Filipendula* thickets noted by Hn; Bolsheredsk noted in A. 53, A. 54 and A. 55; S. E. of Bolsheredsk at

Bolshaja R. noted in A. 56; the Apatcha ford Rubinski 1909; Bannaja R., below »Japonskaja» R. Rubinski 1909; Paratunka Komarov 1908; Mikisha Komarov 1908; Natchika Savitch 1908; Savoiko Komarov 1908, do. July 6th 1920 Hn No. 234; Avatcha Bay acc. to Hook. & Arnott loc. cit.

East Kamtchatka: Petropavlovsk July 21st 1920 Hn No. 531.

Commander Islands: Bering Island Kjellman (mixed in a sheet of *Geum rotundifolium* Hb. Holm.), Dybovsky 1879, and acc. to Fedtsch. loc. cit. Stejneger and Grebnitzky; Copper Island Dybovsky 1879 and acc. to Fedtsch. loc. cit. Stejneger, Grebnitzky and Morozevicz.

Central Kamtchatka: The hot springs at Shtchapina Komarov 1909; Klutchi Bezais 1908 (Hb. Berol.), do. July 2nd 1921 Hn No. 3408 (Malaise).

»Kamtchatka»: Collector unknown Hb. Willd. No. 10012 fol. 1; »Ins. inter Amer. et Kamtsch. Dr. Merk. (Pallas)» Hb. Willd. No. 10012 fol. 2; Rastargujeff; Stewart.

Noted in the following associations:
In *Salix sachalinensis—Filipendula—Geum* ass.:
Single (A. 53, A. 55, A. 97, A. 195); Sparse (A. 54, A. 112, A. 155).
In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 56, A. 61).

In South Kamtchatka *G. macrophyllum* is common and characteristic of the *Salix sachalinensis* thickets along the rivers (the *Salix sachalinensis—Filipendula—Geum* ass.). Occasionally it occurs in wet and shadowy meadows. It flowers from the middle of June to the end of July.

The description of our species was based on specimens cultivated in Hb. Berol. and raised from seeds collected in Kamtchatka. The Kamtchatka plant agrees closely with American specimens. *G. macrophyllum* is often united with *G. japonicum* Thunb. The type specimen in Hb. Thunberg, Uppsala, I have seen. It is a plant which, like *G. macrophyllum* has the lower internode of the style glandular-granuliferous, but differs distinctly from our plant in the form of the leaves. The upper stem-leaves are comparatively long-petiolated, simple, more rounded, with shorter and more rounded serrulation and strongly hirsute (not three-cleft, sharply serrulated, and sparsely hirsute as in *G. macrophyllum*), the upper part of the stem is strongly hairy with viscid hairs. Both the internodes of the style are shorter than in our plant; the upper is distinctly clavate.

Type of distribution: American transgressing into Eastern Asia.

Geographical area: Asia: Saghalin, S. and E. Kamtchatka, Commander Islands. America: from Alaska to Newfoundland, southwards to California, Colorado, Wisconsin and mts. of New York. In Europe escaped from cultivation in several places. In Japan the closely related *G. japonicum* Thunb. and in Saghalin the doubtfully distinct *G. Fauriei* Lév.

515. ***Geum pentapetalum*** (L.) MAKINO in Bot. Mag. Tokyo 24 (1910) p. 32 (*pentapetala*).

KUDO, Fl. Paramush. p. 124. — »*Dryas pentapetala foliis pinnatis*» L., Amoen. Acad. II ed. 1 (1751) p. 353 (Pl. Rar. Kamtsch. p. 20); GMEL., Fl. Sib. III p. 187. — *Dryas pentapetala* L., Sp. pl. ed. I (1753) p. 501; PALLAS, Reise durch versch. Prov. Russ. Reich. III Anhang p. 732 et tab. E e fig. 4, 5; PENNANT, Arct. Zool. (1784) p. CXV; (?)GEORGI, Beschreib. III: 4 p. 1038 quoad pl. Kamtsch. — *Tschaban,* KRASCHENINN., Kamtsch. p. 111. — *Geum Dryas* CRANTZ, Inst. 2 (1766) p. 174. — *Dryas anemonoides* PALLAS, Reise III app. p. 733 in not. 2 —. *Caryophyllata kamtschatica* LAM. in POIR., Encycl. I p. 400. — *Geum anemonoides* WILLD., Sp. pl. II p. 1117; GEORGI, Beschreib. Nachtrag p. 273 quoad pl. Kamtsch; SÉR. in DC., Prodr. 2 p. 553; SCHEUTZ, Monogr. Georum p. 54 excl. *β gracile*. — *Geum kamtschaticum* LAM. in POIR., Encycl. Suppl. 1 p. 618. — *Sieversia anemonoides* WILLD. in Ges. Naturf. Freunde Berlin, Mag. V (1811) p. 398 (excl. syn. *Anemone pusilla*); LEDEB., Fl. Ross. II p. 24 (excl. syn. *Anemone pusilla*). — *Sieversia dryadoides* SIEB. & ZUCC. Fl. Jap. Fam. Nat. I p. 128. — *Geum dryadoides* FRANCH. & SAV., YABE & YENDO, Fl. Shimushu p. (185). — *Sieversia pentapetala* GREENE in Pittonia 4 (1899) p. 49 (excl. syn. *Anemone pusilla*).

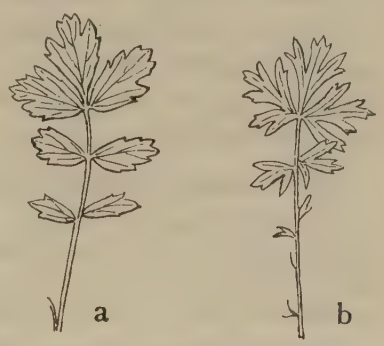


Fig. 9. Leaves of: a *Geum pentapetalum* (HN No. 416); b *Geum selinifolium* (MALAISE No. 155). Natural size.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Lower Ozernaja R. in a bog noted by HN; N. of Ozernaja village noted by HN; N. of Illina volcano noted in A. 207; W. of Sholtovskaja volcano noted in A. 205; lower Kochegochek R. noted by HN; the divide between Shadutka and Ksudach rivers 250 m. Aug. 4th 1921 HN No. 2630; Shadutka volcano 1125 m. noted by HN; Topik 580 m. July 28th 1921 HN No. 2485; Assatcha mts. 670 m. noted by HN; Akhomten Bay 250 m. Sept. 9th 1920 HN No. 1215, do. Sept. 10th 1920 HN No. 1233; Opala volcano July 23th 1921 HN No. 2371; lower Bolshaja R. noted in A. 110; Bystraja R. 12 verst from Bolsheredsk RUBINSKI 1908; Apatcha village noted by HN; Mt. Zaikin mys (Paratunka valley) KOMAROV 1908; Paratunka KOMAROV 1908; between Paratunka and Mikisha KOMAROV 1908 (Hb. Berol.); Mikisha KOMAROV 1908; Shore of Lake Natchika KOMAROV 1908 (Hb. Berol.); Shalsan July 26th 1848 VOSSNESENSKY, do. KOMAROV 1908.

East Kamtchatka: Vicinity of Petropavlovsk PROTOPOPOF 1908; Kalashtyrka valley KOMAROV 1909; between Petropavlovsk and Savoiko July 5th 1920 HN No. 220, do. July 9th 1920 HN No. 416; between Petropavlovsk and Avatcha volcano 250 m. June 24th 1921 HN No. 1814.

»Kamtchatka»: »R. Usteli Kamen Kamtschatskoi» acc. to GEORGI loc. cit. (the place is unknown to me; I have not seen the specimen and it may of course belong to *G. selinifolium*), PETERS, RIEDER 1831, Sept. 11th 1847 VOSSNESENSKY.

Noted in the following associations:

In *Carex—Myrica* ass.:

Abundant (A. 110).

In *Vaccinium—Empetrum*—Lichen ass.:

Sparse (A. 207).

In *Artemisia arctica—Solidago—Salix »arctica»* ass.:

Scattered (A. 205).

In South Kamtchatka this plant is fairly common in the bogs of the lowlands. It also occurs in the heaths and meadows of the alpine region up to an altitude of more than 1100 m. It flowers from the middle of June to the middle of July. Compare under *G. selinifolium*.

Type of distribution: Northern Pacific.

Geographical area: Asia: S.E. Kamtchatka, the Kuriles, Saghalin, Yezo and Honshu. America: the Aleutian Islands. The plant is hitherto not known from the Commander Islands, where it is to be expected.

516. ***Geum Rossii*** (R. Br.) Sér. in DC., Prodr. II (1825) p. 553.

Scheutz, Monogr. Georum p. 59. — [*Sieversia Rossii* R. Br. in Suppl. to Appendix Parry's first Voy. (1824) p. 276 tab. C]; Fedtsch., Fl. Îl. Comm. p. 52 (also var. *humilis*); Kom., Voy. Kamtsch. p. 454. — *Acomastylis Rossii* Rydb. in N. Amer. Fl. 22: 5 (1913) p. 413.

South Kamtchatka: Mt. Krasni Gor, Lake Natchika Komarov 1908.

East Kamtchatka: The Kronoki Pass Komarov 1909; the foot of Klutchevskaja volcano Kurtachof 1909 (sub *Sieversia glacialis* in Hb. Hort. Petrop.).

Commander Islands: Bering Island acc. to Fedtsch. loc. cit. Stejneger and Grebnitzky (var. *humilis*); Copper Island Dybovsky 1879; Grebnitzky 1894 and acc. to Fedtsch. loc. cit. Stejneger, Tilman (var. *humilis*) and Morozevicz (var. *humilis*).

Central Kamtchatka: The Ganala mts. Kittlitz; Anauna R. Aug. 18th 1926 Malaise No. 151, do. Aug. 19th 1926 Malaise No. 152.

West and North Kamtchatka: Between Sedanka and Jelovka Bezais 1909.

»Kamtchatka»: »Petropavlovsk Mertens»; the locality is certainly not correct.

I never met with this plant during my journeys in South Kamtchatka. It is certainly rare also in other parts of the country. The specimens collected in the middle of August at Anauna R. were flowering.

Type of distribution: Eastern Asiatic—Western American.

Geographical area: Asia: known from Chukch Penins., Kamtchatka and Commander Islands. America: known from Melville Island, Nome, islands in the Bering Sea and S.W. Alaska. (Partly var. *humilis* (R. Br.) Ledeb. which seems to me to be merely an inconsiderable form of this plant, but is taken as a separate species — *Acomastylis humilis* (R. Br.) Rydb. — by Rydberg.)

517. ***Geum rotundifolium*** Fisch. in Mém. Soc. Nat. Mosc. 2 (1809) p. 187 tab. 11 fig. 17.

Scheutz, Prodr. Monogr. Georum p. 57; Hultén in Sv. Bot. Tidskr. 22 (1928) pp. 225, 227. — *Sieversia rotundifolia* (Fisch.) Cham. & Schlecht., Ledeb., Fl. Ross. II p. 24; Fedtsch., Fl. Îl. Comm. p. 51. — *Geum calthifolium* Menzies ap. Smith in Rees, Cyclopedia 16 (1819) »*Geum* No. 13» (without pagination); Yabe & Yendo, Fl. Shimushu p. (185) (var. *dilatatum*); Kudo, Fl. Paramush. p. 123 (var. *dilatatum*). — *Geum Camtschaticum* Pallas in herb. ap. Torrey & Gray, Fl. N. Amer. I (1840) p. 425.

Northern Kuriles: Paramushir C. Taro 1892, S. Yokoyama 1893, M. Aizava 1911, Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka Rieder 1831 (sub *G. macrophyllum*), do. collected by Cosacks 1909; Kambolnaja R. Bezais 1909; »ad fl. Ozernoj pr. Lopatka 3—10 Sept. 1847» Vossnesensky; Ozernaja R. Bezais 1909; N. of Kurile Lake noted in A. 208, A. 211; W. of Sholtovskaja volcano 500 m. Aug. 23rd 1922 Hn No. 4379 (A. 205); upper Kidipalok R. 300 m., 600 m. and 1050 m. noted by Hn; Mt. »Dogchinag» (Golygina R.) Rubinski 1909; 10 km. S. of Golygina village in alpine meadow noted by Hn; the divide between Savan and Shadutka R. in alpine meadow noted in A. 80; Topik 580 m. July 28th 1921 Hn No. 2486; N.W. slope of Assatcha mts. in alpine meadow noted by Hn.

Commander Islands: Bering Island Kjellman (mixed with *G. macrophyllum* in Hb. Holm.), Dybovsky 1879, Dobrotvorsky 1881, Stejneger 1895 and 1897 acc. to Fedtsch. loc. cit., Grebnitzky 1894; Copper Island Dybovsky 1879, Grebnitzky 1890 and acc. to Fedtsch. loc. cit. Tilman, Stejneger and Morozevicz.

»Kamtchatka»: »Kamtsch. et Insulae Pallas» (probably collected by Steller) Hb. Willd. No. 10013 fol. 3 sub *G. radiatum;* »Tigil Levitzky 1848». The place is not given on the original label and is certainly incorrect.

Noted in the following associations:
In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Profuse (A. 211).
In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Sparse (A. 80); Scattered (A. 205); Abundant (A. 208).

This plant is characteristic of the alpine meadows in the southern part of South Kamtchatka and a special *Geum rotundifolium*-facies of the alpine meadows must be said to exist there. It often occurs in great abundance, especially in an area N. of Kurile Lake. It has a distinct northern limit of distribution at about 52° 20′ N. lat. It flowers in July and August.

American authors do not use this, the oldest, name for our plant, as it was already employed (*Geum rotundifolium* Moench, Meth. Plant. Hort. Bot. Marburg p. 64, 1794). The latter plant is, however, a *Saxifraga* species, and

as that name is thus not valid I can see no objection to using the name *G. rotundifolium*.

Type of distribution: Northern Pacific.

Geographical area: Asia: Commander Islands, southern Kamtchatka, the Kuriles, southern Yezo and Honshu. America: the Aleutian Islands, southern Alaska and Yukon to British Columbia. On the Alaska Peninsula the closely related *Geum macranthum* and in E. America *Geum Peckii* PURSH and *Geum radiatum* MICH.

518. ***Geum selinifolium*** (FISCH. in herb. seq. FR. SCHM.) nov. comb.

Anemone pusilla GAERTN. in Novi Comm. Ac. Sc. Imp. Petrop. XIV (1770) p. 543 tab. XIX fig. 2, 3. — *Sieversia anemonoides β tenuis* REGEL & TILING, Fl. Ajan. p. 82. — *Sieversia selinifolia* REGEL & TILING, Fl. Ajan. in Nouv. Mém. Soc. Imp. Nat. Mosc. XI (1859) p. 82 (as a synonym); FR. SCHMIDT in Mém. Ac. Imp. Sc. St. Petersb. XII Sér. VII Bot. (1868) p. 39.

East Kamtchatka: The Kronoki Pass KOMAROV 1909; Klutchevskaja volcano BEZAIS 1908, do. Aug. 7th 1927 MALAISE No. 623.

Central Kamtchatka: Anauna R. Aug. 8th 1926 MALAISE No. 154; do. Aug. 19th 1926 MALAISE No. 155.

West and North Kamtchatka: Between Sedanka and Jelovka BEZAIS 1909.

This species was at first described and figured as *Anemone pusilla* by GAERTNER. The name *Geum pusillum* cannot, however, be used as recently a plant from New Zealand obtained that name (PETRIE in Transact. N. Z. Inst. XXVIII p. 538). The plant must thus be named as above. Is it taken to the genus *Sieversia* its name should be *Sieversia pusilla* (GAERTN.) nov. comb.

G. selinifolium was hitherto often united with *G. pentapetalum* as a variety of that species. Intermediate forms between the two plants, however, apparently do not exist, and as they differ in several important respects I think that there can be no doubt that they should be taken as distinct species. *G. selinifolium* has much finer and less lignous rootstock than *G. pentapetalum*. The difference in leaf-form is seen from fig. 9 a and b. No trace of transition-forms between them were seen. The flowers are larger (26—30 mm. in diameter, in *G. pentapetalum* only 18—21 mm. at least in Kamtchatka specimens) and the stamens seem to be more equilong. Ripe fruits are not present in my material, but to judge from half-ripe material the achenes pass more abruptly into the tails.

Type of distribution: Eastern Asiatic.

Geographical area: Known from Jakutsk prov. (Dshugdshur mts. Kotlovina R.), Ochotsk and Gishiginsk distr., southwards to Udskoj distr. (sources of Bureja R.) and central Kamtchatka.

519. ***Geum strictum*** AITON, Hort. Kew. 2, ed. 1 (1789) p. 217.

LEDEB., Fl. Ross. II p. 22 saltem quoad pl. Kamtsch.; SCHEUTZ, Prodr. Monogr. Georum p. 28. — *Geum strictum* AIT. . . . *Geum canadense* MURR., CHAM. in Linnaea VI (1831) p. 589; ERMAN, Verzeichn. p. 64. — *Geum intermedium* FISCHER in

Mém. Soc. Imp. Nat. Mosc. II (1809) p. 185. — *Geum Aleppicum* KUDO, Fl. Paramush. p. 123.

Northern Kuriles: Paramushir KUDO 1920.

South Kamtchatka: Golygina village noted by HN; Bolsheredsk July 8th 1921 HN No. 2043; between Bolsheredsk and Apatcha at the path noted by HN; Apatcha village noted by HN; the hot springs at Siku R. noted by HN; Paratunka STUBENDORFF; Mt. »Gorelaja gora» KOMAROV 1908 (Hb. Berol.); Nikolajevsk KOMAROV 1908; Uzdets R. SAVITCH 1908; Natchika village noted by HN; at the »Jurta» between Natchika and Korjaka noted by HN; Palovinaja R. KOMAROV 1908; Savoiko July 7th 1920 HN No. 272; Korjaka village noted by HN; Bogatyrjovka July 16th 1920 HN No. 460.

East Kamtchatka: Petropavlovsk MERTENS, do. June 20th 1920 HN No. 1779 a.

Central Kamtchatka: Vershne Kamtchatsk VOSSNESENSKY 1846; Tolbatchik PROTOPOPOF 1909; Klutchi BEZAIS 1908.

West and North Kamtchatka: Kol ZELENIN 1908; Tigil acc. to ERMAN loc. cit.

»Kamtchatka»: STEWART (sub *G. urbanum*), KASTALSKY, MERTENS, KITTLITZ, PETERS 1831, RIEDER (sub *G. urbanum*), Collector unknown (sub *G. intermedium* Hb. TRAUTV.).

In South Kamtchatka this plant is common in the neighbourhood of villages and on paths. It was never observed in those parts of the country that are not visited by man. It appears doubtful therefore whether it is indigenous within the area or not.

It is sharply distinct from *G. macrophyllum* in the form of the leaves and I did not observe any forms intermediate between those species.

Our plant certainly belongs to *G. strictum* AIT. This plant is often considered (for instance by ASCHERS. & GRAEBN. in Synops. Mitteleur. Fl. VI: 1 p. 879) to be a synonym of *G. Aleppicum* JACQUIN (Icon. plant. rar. I 1781—1786 p. 10 tab. 93) and in the original description AITON himself cites this name as a synonym. The picture given by JACQUIN shows a plant with radical leaves having large rounded slightly lobated terminal leaflet, and several European specimens of the corresponding plant also have similar large basal leaves. Our plant usually has a three-cleft acutely serrated terminal leaflet on the radical leaves, but sometimes leaves occur resembling that illustrated by JACQUIN. They are then small and wither early. As our plant is apparently not quite identical with the European, I prefer to name it as above, which is in any case correct. The difference between the two plants is certainly not great and after a close study of a large amount of material from Europe, Asia and America it may perhaps prove most rational to unite them under the older name *G. Aleppicum*. In this case *G. strictum* AIT. will form a geographical race covering a large area in America and Asia, while other geographical races, *G. Aleppicum sensu strictu* and the still more different *G. hispidum* FR. and *G. molle* VIS. & PANČ., occupy smaller areas in Europe.

Type of distribution: ?Circumpolar.

Geographical area: In southern Europe *G. molle*, in eastern Europe *G. Aleppicum* and *G. hispidum*, to the east possibly also our type. Asia: *(G. strictum)*: at Obi from about 65° N. lat., at Yenisei from about 62° N. lat., from Jakutsk prov. and Kamtchatka southwards to northern Akmolinsk prov. Semiretchensk prov., China and Honshu. America: from British Columbia to Newfoundland, southwards to Arizona, Mexico (acc. to RYDB.) and Pennsylvania.

Coluria geoides R. BR.

Dryas geoides GEORGI, Beschreib. 3: 4 p. 1039.

The report of this plant from Kamtchatka is probably due to confusion with *Geum pentapetalum*. Compare PALLAS, Reise durch versch. Prov. Russ. Reich. III Anhang p. 732 in nota.

520. ***Dryas octopetala*** L., Sp. pl. ed. 1 (1753) p. 501.

MERTENS, Bemerk. Fl. Koragins p. 62 — ?»*Dryas integrifolia—octopetala*» MERTENS, Bemerk. Fl. Koragins p. 64.

South Kamtchatka: Golygina RIEDER 1833; Shadutka volcano 1125 m. Aug. 2nd 1921 HN No. 2611; Grishkinoj R. (Lake Natchika) KOMAROV 1908; Mt. Krasni gor KOMAROV 1908 (partly var. *argentea* BLYTT); Lake Natchika KOMAROV 1908.

East Kamtchatka: Lake Kronoki 900 m. Sept. 12th 1921 HN. No. 3581 (MÅLAISE); the Kronoki Pass KOMAROV 1909 (Hb. Holm. »*D. Kamtschatica* JUZEPCZUK»); Klutchevskaja volcano N.E. slope AFANASEJEV 1909; Ploskaja volcano, »pervaja na dolu sopotchka» PROTOPOPOF 1909; the Chartchina mts. Aug. 12th 1927 MALAISE No. 627.

Central Kamtchatka: Gremushej R. KOMAROV 1908 (Hb. Berol.); Ganala STEWART; Svetloj klutch R. May 22nd 1925 MALAISE No. 477; Anauna R. Aug. 19th 1926 MALAISE No. 148.

West and North Kamtchatka: Karaginsk Island acc. to MERTENS loc. cit.

In South Kamtchatka *D. octopetala* is very rare. It seems to be more common to the north. MERTENS loc. cit. reports *D.* »*integrifolia—octopetala*» from Karaginsk Island. The most probable is that his plant was the small-leafed arctic form of *D. octopetala*, but as *D. integrifolia* occurs in the Chukch Penins. it is of course possible that it goes as far south as to the northernmost part of our area.

Type of distribution: ?Circumpolar, arctic-alpine.

Geographical area: Europe: Iceland, Spitzbergen, Nova Zembla, Scotland, mts. of Scandinavia, Kola penins., arctic Russia, the Urals southwards to Orenburg, the Pyrenees, the Alps, the Apennines, mts. of the Balkans, the Carpathians, Siebenbürgen, Caucasus. Asia: along the north coast to Chukch Penins.; southwards in the mts. to Altai, northern Mongolia, Pei-shan and Honshu

(not known from the Kuriles or from Saghalin). America: the north coast of Alaska, ?Boothia Felix (not known from the Arctic Archipelago); southwards in the Rocky Mts. to Colorado. W. Greenland between 76° and 80° N. lat. E. Greenland from Scoresby Sound northwards.

521. ***Filipendula kamtschatica*** (PALL.) MAXIM. in Acta Horti Petrop. VI (1879) p. 248.

DITMAR, Reisen I pp. 279, 423, 447, 552, 687; FEDTSCH., Fl. Îl. Comm. p. 50; KOM., Voy. Kamtch. pp. 56, 412, 455, et Fl. Penins. Kamtsch. I p. 331. — »*Spiraea foliis multifidis, angulatis. . .*» GMEL., Fl. Sib. III p. 192. — »*Spiraea* GM. Sib. III 192 No. 55.» PENN., Arct. Zool. (1784) p. CXV. — »*Ulmaria*» STELLER in PALL., Neue Nord. Beitr. II p. 301; PALLAS in Stralsund. Mag. II (1768) p. 176. — *Ulmaria camtchatica* PALLAS in Stralsund. Mag. II (1768) p. 177; YABE & YENDO, Fl. Shimushu p. (186). — *Spiraea camtschatica* PALL., Fl. Ross. I: 1 (1784) p. 41 tab. 28; KRASCHENINN., Kamtsch. p. 108; GEORGI, Beschreib. III: 4 p. 1024; CHAM. in Linnaea II (1827) p. 5; CHAMISSO, Reise u. d. Welt p. 346; ERMAN, Verzeichn. p. 64; LEDEB., Fl. Ross. II p. 19; KITTLITZ, Denkwürd p. 327; DITMAR, Reisen I p. 108, Reisen II pp. 84, 96. — ?*Spiraea Ulmaria* GEORGI, Beschreib. III: 4 p. 1023 quoad pl. Kamtsch.

Northern Kuriles: Paramushir C. TARO 1892, S. YOKOYAMA 1893, T. MATSUBARA 1915, KUDO 1920 all acc. to KUDO loc. cit.; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka BJELOUSSOF 1914, do. June 22nd 1920 HN No. 92; »Pauschinsk» hot spring (Pausetek) VOSSNESENSKY Sept. 16th 1847; the mouth of Ozernaja R. GUDZENKO 1910; lower Ozernaja R. Aug. 12th 1921 HN No. 2817, do. noted in A. 96, A. 97, A. 100; upper Unkanakchek R. noted in A. 196, A. 197, A. 199, A. 200; Kusetenek R. noted in A. 194, A. 195; Sahach noted in A. 193; Golygina R. at the mouth of Ksudach R. noted in A. 89, A. 90; Golygina VOSSNESENSKY 1847; upper Ksudach R. noted in A. 85; middle Ksudach R. noted by HN; between the mouths of Opala and Golygina rivers noted in meadow by HN; the hot spring at Shadutka noted by HN; upper Savan R. noted by HN; middle Assatcha R. Aug. 11th 1922 HN No. 4213; the hot spring at Savan R. noted by HN; Topik noted by HN; S. W. of Topik noted by HN; middle Opala R. common in *Betula* forest noted by HN; Assatcha mts. 600 m. noted by HN; do. N. W. slope 410 m. noted by HN; Opala R. at Tsavats R. RUBINSKI 1909; the hot spring at Opala R. noted in A. 180, A. 181; Akhomten Bay noted in A. 30; upper Udoshk R. noted by HN; N. W. of Opala volcano noted in A. 66; upper Abshen R. noted in *Betula* forest (first flower for the season on July 17th 1921); lower Bolshaja R. noted in A. 112; the mouth of Balaganchik R. noted in A. 155; middle Karymchina R. in *Angelica ursina* meadow noted by HN; lower Karymchina R. noted in A. 124, A. 151; Agashka R. noted in A. 62, A. 63, A. 64, A. 65; W. of the mouth of Ipelka R. noted in A. 57; Danilina R. noted in A. 61; the Kohelok mt. 660 m. in alpine meadow noted by HN; S. E. of Bolsheredsk noted in A. 56; between Apatcha and Siku noted in A. 150; between Bolsheredsk and Apatcha noted in A. 113; Bolsheredsk noted

in A. 53, A. 54, A. 55; the hot springs at Siku R. noted in A. 122; lower Bannaja R. noted in *Betula* forest; »Malenki klutchik» Bannaja noted by Hn; Lake Blishne acc. to Kom. loc. cit.; the mouth of Paratunka R. Aug. 11th 1920 Hn No. 830; Shalsan R. Komarov 1908; Mt. Zerkalo, Natchika under single *Betula* trees in the meadow noted by Hn, do. 400 m. noted in A. 115; Savoiko Komarov 1908; Korjaka valley Komarov 1908 (Hb. Berol.).

East Kamtchatka: Petropavlovsk Chamisso, do. Mertens, do. July 21st 1920 Hn No. 547; Kalashtyrka Perfiljef 1910; between Petropavlovsk and Avatcha volcano noted in A. 24 a; Semjatchik Komarov 1909; Kishpinitch volcano Komarov 1909; the Kronoki Pass acc. to Kom. loc. cit.; Lake Kronoki Komarov 1909 (Hb. Berol.); Lake Assabatch Aug. 15th 1925 Malaise No. 475.

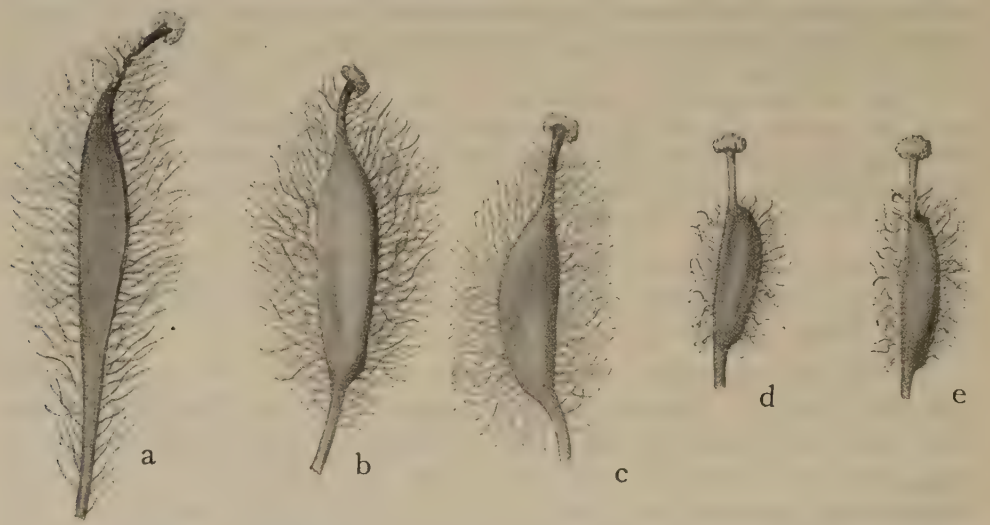


Fig. 10. Carpels of: a *Filipendula kamtschatica* (Hn No. 940); b, c *F. kamtschatica*×*palmata* (Kalashtyrka, Perfiljef); d, e *F. palmata* (Hn No. 248 b). All enlarged 10: 1.

Commander Islands: Bering Island Steller, Dybovsky, Stejneger and Morozevicz all acc. to Fedtsch. loc. cit.

Central Kamtchatka: Malka acc. to Kom. loc. cit.; between Pushtchina and Ganala acc. to Ditmar loc. cit.; Sharomsk Protopopof 1908, do. Komarov 1909; between Vershne-Kamtschatsk and Milkova acc. to Ditmar loc. cit.; Milkova acc. to Ditmar loc. cit.; Shtchapina Komarov 1909; Ushki Rubinski 1908.

West and North Kamtchatka: Sedanka acc. to Ditmar loc. cit.; Tigil acc. to Ditmar loc. cit.

»Kamtchatka»: Eschscholtz, Peters, Kittlitz (part of the specimens).

Noted in the following associations:

In *Salix sachalinensis—Filipendula—Geum* ass.:

Profuse (A. 53, A. 54, A. 55, A. 97, A. 112, A. 155, A. 195).

In *Alnus hirsuta—Filipendula—Dryopteris* ass.:
Profuse (A. 65, A. 194, A. 199, A. 200).
In *Betula Ermani—Filipendula—Dryopteris* ass.:
Single (A. 62, A. 63, A. 64, A. 180, A. 197); Scattered (A. 115); Abundant (A. 30); Profuse (A. 24 a, A. 196).
In *Betula Ermani—Filipendula—Equisetum hiemale* ass.:
Single (A. 150); Scattered (A. 57); Abundant (A. 89); Profuse (A. 90).
In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 113, A. 124, A. 151); Sparse (A. 122); Abundant (A. 56, A. 61).
In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 66, A. 96, A. 100).
In *Filipendula—Calamagrostis—Sanguisorba* ass.:
Single (A. 85); Scattered (A. 193).
In *Carex—Sanguisorba*—Moss ass.:
Single (A. 181).

In South Kamtchatka *Filipendula kamtschatica* is a very common plant characteristic of several associations, in the first place of the *Salix sachalinensis* thickets along the rivers, which in the lowlands are practically always bordered by thickets of our species, but also of certain *Betula* forests of a wet and shady type. In the meadows it occurs constantly in the high shady *Angelica ursina* meadows along the western coast and more occasionally in wet and high-grown *Thalictrum* meadows of the common type. Only rarely does it reach the alpine region, where it then occurs in the meadows. The species attains a height of about 2 m. 30 cm.; leaves 32, 33 and 36 cm. in length and 47, 51 and 50 cm. broad, respectively, were measured, their petioles were 16—19 cm., the stipules 10 cm. long and 3,5 cm. broad, and the circumference at the stem was about 10 cm.

A certain very characteristic kind of brown-red peat is formed out of the dead stems and leaves. The stems are hollow and convenient to use when drinking water from the brooks.

The plant flowers only for some few days between the middle of July and the middle of August. Its Kamtchatka name is »Chlamainik». Compare also the following hybrid.

Type of distribution: Asiatic Pacific.

Geographical area: Asia: from northern Kamtchatka and Commander Islands southwards over the Kuriles, Yezo, Saghalin and Ussuri to South-Ussuri, Corea and the mts. of Honshu. (In Ussuri acc. to Kom. not far from the coast.) America: the western Aleutian Islands. In Ussuri and on Corea also the closely related *F. purpurea* Maxim.

Filipendula kamtschatica* × *palmata nov. hybr.

South Kamtchatka: Savoiko Sept. 7th 1908 Komarov.

East Kamtchatka: Kalashtyrka Perfiljef 1910.

Central Kamtchatka: »Ulovioj»(?) R. Aug. 13th 1908 BEZAIS (judging from the date situated between Kosyrevsk and Tolbatchik. Comp., KOMAROV, Fl. Penins. Kamtsch. I p. 25).

»Kamtchatka»: A specimen in Hb. Acad. Petrop. collected by KASTALSKY probably belongs to this group.

The specimens enumerated above can hardly be referred to either of the two species *F. kamtschatica* or *F. palmata*. As they all have empty capsules and are in certain respects intermediate between those two species I must consider them to be of hybrid origin. The component that is most easy to prove in the hybrid is *F. palmata*, which is at once recognised by the white tomentum on the under side of the leaves, which however is sometimes very inconsiderable (the specimen of BEZAIS), by the characteristic many-lobed form of the terminal leaflet and by the large pinnae. The form of the leaves, however, is sometimes fairly intermediate between the two species. It seems probable that LEDEBOUR's *Spiraea digitata* α *glabra* (Fl. Ross. II p. 18) includes such forms. The above-enumerated specimens all differ from one another a good deal and apparently represent different hybrid forms. A comparison between the two parent species and the hybrid is given below: *F. palmata*: Carpels with a short stipe, suddenly widened, in the margins with comparatively long crisp hairs, at the apex suddenly narrowed to the glabrous style (sometimes with some few hairs near the base) (Fig. 10 d, e). Stigmata large. Leaves sharply serrulated, with a tomentum below, the terminal leaflet 7—9-lobated, the lobes long, narrower at the base. The first pair of pinnae large, 3—5-lobated. Rachis and veins on the under side of the leaves puberulent. *F. kamtschatica:* Carpels with a long slowly tapering stipe, in the margins with straighter hairs, tapering towards the apex to a long style, hairy practically to the end (Fig. 10 a). Stigmata, if the difference in the size of the entire carpels is taken into consideration, proportionally smaller. Leaves short-serrulated or nearly denticulated, glabrous beneath, except on the veins, which are beset with short brownish bristles. Terminal leaflet 5-lobated, the lobes short and broad, pinnae small or absent.

F. kamtschatica × *palmata:* Carpels and stigmata intermediate between the parent species (Fig. 10 b, c). Carpels empty. Style long-hairy. Leaves varying considerably, but always with a less marked tomentum than *F. palmata*, usually 7-lobated, in the case of KASTALSKY's and KOMAROV's specimens with lanceolate, comparatively sharp serrulated long parts, which are not narrower at the base than in the middle; in the case of PERFILJEF's specimen more like *F. palmata* but with broader lobes.

522. ***Filipendula palmata*** (PALL.) MAXIM. in Acta Horti Petrop. VI (1879) p. 250.

»*Spiraea folio impari maiori multifido...*» GMEL., Fl. Sib. III p. 192 quoad pl. Kamtsch. — »*Spiraea* GMEL. Sib. III 192 No. 56» PENNANT, Arct. Zool. (1784)

p. CXV. — *Spiraea palmata* PALL., Fl. Ross. I: 1 (1784) p. 40 tab 27[1] non THUNB. nec. L. fil.; CHAM. in Linnaea VI (1831) p. 589. — *Spiraea digitata* WILLD., Sp. pl. II (1799) p. 1061; ERMAN, Verzeichn. p. 64; LEDEB., Fl. Ross. II p. 17. — *Ulmaria palmata* (PALL.) FOCKE in ENGL. & PRANTL., Nat. Pfl. fam. III: 3 p. 41.

South Kamtchatka: Near the hot spring at upper Opala R. noted by HN; lower Bolshaja R. noted in A. 107; 10 km. W. of Bolsheredsk Aug. 23rd 1921 HN No. 2925; E. of Bolsheredsk at Bolshaja R. noted by HN; S. E. of Bolsheredsk noted in A. 56; Apatcha noted by HN; Nikolajevsk RAMENSKI 1908; Savoiko July 7th 1920 HN No. 248 b; 5 km. W. of Korjaka village noted by HN.

Central Kamtchatka: Sharomsk acc. to MAXIM. loc. cit.; Kirganik KOMAROV 1909; Shtchapina KOMAROV 1909 (at least part of the specimens), do. July 27th 1921 HN No. 3474 (MALAISE); Klutchi BEZAIS 1908, do. AFANASEJEV 1909.

West and North Kamtchatka: Chairusovaja NOVIKOF; Tigil »AD ERMAN A. v. CH.» (Hb. Berol. sub *S. digitata* WILLD.).

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 107).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 56).

In South Kamtchatka this plant is comparatively rare and it seems doubtful whether it occurs at all in the southernmost part.

It usually occurs scattered in the meadows. It flowers from the middle of June to the middle of August.

MAXIMOVICZ loc. cit. states that Kamtchatka specimens are high-grown and are habitually like *F. kamtschatica*, from which, however, they differ in the form of the leaves and in the hairiness. This is not the case. Kamtchatka specimens are as low-grown as the others and of quite the same type, but MAXIMOVICZ probably had at hand one or two specimens of the hybrid *F. kamtschatica* × *palmata*, which may be expected to occur only in Kamtchatka, on Saghalin, in Ussuri and Corea, as those are the only places where both plants occur. For critical notes see under that hybrid.

Type of distribution: Eastern Asiatic.

Geographical area: From Olekminsk distr., Jakutsk distr., Gishiga and northern Kamtchatka southwards to S. E. Mongolia, Shansi(!), Chili, Corea, Saghalin and South Kamtchatka. Reported from the Kuriles by MAXIMOVICZ only.

523. ***Sanguisorba officinalis*** L., Sp. pl. ed. I (1753) p. 116.

South Kamtchatka: Akhomten Bay 250 m. Sept. 9th 1921 HN No. 1216, do. Sept. 11th 1921 HN No. 1315; the hot springs at Bannaja R. RUBINSKI

[1] In the same year the same name was published by THUNBERG in Fl. Jap. p. 212. THUNBERG's plant was the one now usually called *F. purpurea* MAXIM. Which of the two names has priority I do not know.

1909; Paratunka »Zaikin Kameni» Komarov 1908; Tarja Bay Komarov 1908 (Hb. Berol.); the Natchika Pass Rubinski 1909.

East Kamtchatka: between Petropavlovsk and Avatcha volcano 350 m. Aug. 6th 1920 Hn No. 759; Uzon Komarov 1909; the Kronoki Pass Komarov 1909; Klutchevskaja volcano 3 000 feet Bezais 1908, do. E. slope 3 000 feet Bezais 1909; Lake Assabatch Aug. 10th 1925 Malaise No. 478.

Central Kamtchatka: Near Korjatskaja volcano Komarov 1908; Klutchi Bezais 1908.

West and North Kamtchatka: Between Sedanka and Jelovka Aug. 20th 1927 Vavilin (Hb. Holm.)

In South Kamtchatka this plant is rare in its pure form, but it seems to be more frequent to the north. It flowers in July and the beginning of August. It is in close agreement with Scandinavian specimens.

Type of distribution: Eurasiatic, transgressing into Western America.

Geographical area: Europe: from E. Iceland, Ireland, Scotland, southern Norway, Gotland, southern Kola and the northern Urals southwards (especially in the mts.) to Spain, Italy, the Balkans and Caucasus. Asia: at Obi from about 66° N. lat., at Yenisei from about 71° N. lat., from the mouth of Lena and from middle Kolyma R., southwards to Asia Minor, northern Persia, Mongolia, Northern China (to Shensi and Kiang-su), Corea and Honshu (some few localities). (Not known from Saghalin, the Kuriles, southernmost Kamtchatka or northern Yezo). America: the corresponding American plant is regarded by Rydberg as a separate plant *S. microcephala* Presl. distributed acc. to him from Alaska and Yukon terr. to California. Specimens that I have seen from Alaska agree, however, so well with the Eurasiatic plant that I must consider them as belonging to the same species. In E. Amer. our plant occurs introduced.

Sanguisorba officinalis* × *tenuifolia Korsh. in Acta Horti Petrop. XII (1893) p. 328.

As practically all specimens of *S. tenuifolia* typus in Kamtchatka are more or less infected by *S. officinalis* (compare the discussion below) it seems most correct to quote the literature concerning those forms under the hybrid even when the corresponding specimens could not be controlled:

»*Sanguisorba spicis longissimis. . .*» Gmel., Fl. Sib. III p. 143 quoad pl. Kamtsch. — *Sanguisorba canadensis* Pall. in Neue Nord. Beitr. II (1781) p. 300; Pennant, Arct. Zool. (1784) p. CXIV; Georgi, Beschreib. III: 4 p. 739. — *Sanguisorba tenuifolia* Cham. in Linnaea VI (1831) p. 590; Erman, Verzeichn. p. 64; Ledeb., Fl. Ross. II p. 28; Maxim. in Mél. Biol. IX: 1 (1873) p. 153 (α *alba*, β *purpurea*); Yabe & Yendo, Fl. Shimushu p. (186) (var. *purpurea*); Koidz. in Journ. Coll. Sc. Tokyo XXXIV: 2 (1913) p. 218 (var. *alba*); Kom., Voy. Kamtch. p. 453; Kudo, Fl. Paramush. p. 125 (var. *kurilensis*). — *Sanguisorba canadensis* var. *media* Koidz. in Journ. Coll. Sc. Tokyo XXXIV: 2 (1913) p. 215 quoad pl. Kamtsch. — *Sanguisorba grandiflora* Makino in Bot. Mag. Tokyo XXI (1907) p. 141; Koidz. in Journ. Coll. Sc. Tokyo XXXIV: 2 (1913) p. 220.

Northern Kuriles: Paramushir C. Taro 1892, S. Yokoyama 1893, T. Matsubara 1915, Kudo 1920 all acc. to Kudo loc. cit.; Shumshu acc. to Yabe & Yendo and Koidz. loc. cit.

South Kamtchatka: S. of Kambolnaja R. Rubinski 1909; Kurile Lake noted in meadow by Hn; lower Ozernaja R. Aug. 12th 1921 Hn No. 2802, do. 30 verst from the mouth Rubinski 1909, do. noted in A. 100; Ozernaja village noted by Hn; N. E. of Javina village noted in A. 95; between the branches of Kochegochek R. noted by Hn; between Kochegochek and Javina noted in A. 91, A. 92; S. of Kochegochek noted in heath (*Vaccinium—Empetrum*—Moss ass.); upper Kusingen R. noted in A. 190, A. 192; do. in meadow and in heath noted by Hn; lower Golygina R. in heath noted by Hn; S. of Golygina village in heath and in meadow noted by Hn; upper Ksudach R. noted in A. 83, A. 84; middle Ksudach R. noted in A. 85, A. 86, A. 87; between the mouths of Opala and Golygina rivers in meadow noted by Hn; upper Shadutka R. in meadow noted by Hn; W. of Shadutka volcano in meadow noted by Hn; N. of the mouth of Opala R. noted in A. 214; lake Sterbot noted in A. 216; upper Savan R. noted in A. 79, A. 80, do. 250 m. Aug. 1st 1921 Hn No 2560; middle Assatcha R. Aug. 11th 1922 Hn No. 4214 a and b; Topik in *Alnus hirsuta* swamps noted by Hn; near Assatcha mts. in *Betula japonica* meadow noted by Hn; N. W. of Assatcha mts. 410 m. noted by Hn; upper Opala R. near Assatcha noted in A. 181, A. 184, A. 185; the mouth of Artemjeva R. noted in A. 221; Lake Kambolnoje noted in A. 218; the mouth of Stegnova R. noted in A. 219; the hot springs at Opala R. Aug. 4th 1922 Hn No. 4151 (A. 182); Tikhirka Bay Rieder 1833 (sub *S. officinalis β auriculata*); Akhomten Bay Sept. 10th 1920 Hn No. 1241 (A. 37 b); upper Udoshk R. noted in A. 78 b; Opala volcano noted in A. 77, A. 78 a; N. W. of Opala volcano noted in A. 66, A. 67, A. 68, A. 69; lower Tolmachovaja R. noted by Hn; Zykovaja noted in A. 217; upper Abshen R. the first flower for the season noted on July 17th 1921 by Hn; near the mouth of Bolshaja R. on the border of ponds in peatbog noted by Hn, do. July 5th 1921 Hn No. 1994; lower Bolshaja R. noted in A. 104, A. 105, A. 107, A. 108, A. 110; junction of Tolmachovaja rivers noted in A. 157; lower Tolmachovaja R. noted in A. 156; the mouth of Balaganchik R. noted in A. 152, A. 153; middle Karymchina R. noted in A. 102; lower Karymchina R. noted in A. 123, A. 124, A. 151; do. in meadow and *Angelica ursina*-meadow noted by Hn; Ipelka R. noted in A. 60; Bolsheredsk noted by Hn; S. of Bolsheredsk in meadow noted by Hn; between Bolsheredsk and Apatcha noted in A. 113; the hot springs at Siku R. noted in A. 122; Apatcha in meadow noted by Hn; Natchika village Komarov 1908.

East Kamtchatka: Kalashtyrka Komarov 1909.

West and North Kamtchatka: Chairusovaja Novikov 1909 (close to *S. tenuifolia*); Tigil Levitsky 1848, do. Bezais 1909 (close to *S. tenuifolia*).

»Kamtchatka»: Kusmischeff (sub *S. media*) (beautiful form with *S.*

tenuifolia-like leaves but with rounded red-flowered spikes), KEGEL (sub *S. media*).

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 66, A. 184); Sparse (A. 68, A. 78 b, A. 79, A. 105, A. 153); Scattered (A. 83, A. 84, A. 85, A. 86, A. 91, A. 100, A. 107, A. 182, A. 185); Abundant (A. 69, A. 92); Profuse (A. 67, A. 190).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 113, A. 122, A. 124); Sparse (A. 151).

In *Betula platyphylla—Thalictrum—Carex* ass.:
Scattered (A. 157); Abundant (A. 152).

In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Single (A. 216); Sparse (A. 217).

In *Carex—Sanguisorba—Moss* ass.:
Scattered (A. 181, A. 192, A. 219, A. 221); Abundant (A. 60, A. 87, A. 123).

In *Carex—Myrica* ass.:
Scattered (A. 110).

In *Vaccinium—Empetrum*—Moss ass.:
Single (A. 95, A. 104, A. 108, A. 214); Sparse (A. 156); Scattered (A. 218).

In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Sparse (A. 78 a); Scattered (A. 77).

In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 37 b); Sparse (A. 80).

In South Kamtchatka this is one of the most common plants. Whether it is more rare to the north or not I do not know. It was seldom collected in the central and northern part of our area, but it often happens that non-professional collectors do not collect the most common plants.

Our plant is characteristic of the alluvial meadows and occurs very frequently in low and open meadows. However, it can stand very different ecological conditions and thus occurs also in all kinds of high, shady or wet meadows, as well as in dry heaths, though in the heaths as well as in the wet meadows in lower frequency. It is not uncommon in the subalpine meadows along the western coast and also occurs occasionally in the meadows of the lower alpine region. In the *Betula Ermani*-forests, the undergrowth in which is otherwise closely related to that of the meadows, it never occurs.

Practically all specimens of the genus *Sanguisorba* in Kamtchatka — if we exclude the rare pure *S. officinalis* — form a continuous series between the two species *S. officinalis* and *S. tenuifolia* and it seems to me impossible to regard them as forms of *S. tenuifolia*, as earlier authors have generally done. They certainly represent innumerable forms of the hybrid between those species, showing — often within the same small meadow — all kinds of combinations between the characteristics of the two parent species. Usually *S.*

tenuifolia is the most prominent component in the hybrid. It is a plant with the stem comparatively strongly branched above, with narrow, long, white-flowered spikes. Its leaves are 7—15-pinnate with narrowly lanceolate to linear, sharply serrulated, sessile or very short petiolated pinnae, at least those at the basal leaves provided with »stipules» at the base (smaller pinnae which have been displaced towards the large ones?). The filaments are long-exserted (usually longer than the spike is broad) and dilated. The sepals are glabrous or practically glabrous underneath.

S. officinalis has simple or slightly branched stem with short, rounded, dark-red flowered spikes. The leaves usually have fewer, oblong-obovate, petiolated pinnae with cordate base and are without such »stipules» as in *S. tenuifolia*, but they often have small single pinnae between the large ones. The filaments are filiform and not at all, or only slightly, exserted. The sepals are gray-hairy underneath. The hybrid influence is sometimes, although rarely, visible to about the same extent in all these organs (Hn No. 4214 may be said to be practically intermediate or possibly a little closer to *S. officinalis*). Usually the characteristics are combined, apparently accidently, with the result that a multitude of forms occur. Many of these forms, which also occur in Manchuria and Japan, are described under separate names, such as *S. tenuifolia* var. *alba* Trautv. & Mey., var. *purpurea* Trautv. & Mey., var. *grandiflora* Maxim., (= *S. grandiflora* Makino), var. *kurilensis* Kudo, *α angustiloba* Freyn (Österr. Bot. Zeitschr. XLV 1895 p. 314), *β latiloba* Freyn loc. cit.[1]

S. tenuifolia var. *parviflora* Maxim. (= *S. parviflora* Takeda) seems, as already stated by Korshinsky loc. cit., to represent the pure *S. tenuifolia*, which is common in Manchuria. *S. baicalensis* Poplawskaja (Bull. Acad. Petrop. 1914 p. 137) also seems to belong to the hybrid series, being a form very closely allied to *S. officinalis* and but very slightly infected by *S. tenuifolia*. To this series also certainly belong several of the *Sanguisorba* species lately described from Japan and Corea, *e.g. S. unsanensis* Nakai (Fedde, Rep. Spec. Nov. XIII 1915 p. 278). One might possibly suspect that the American *S. sitchensis* was the corresponding hybrid with *S. canadensis*, but as I have seen only one specimen of the plant I will not express any opinion on it. Its comparatively glabrous bracts urgue against this assumption.

524. ***Sanguisorba tenuifolia*** Fisch. ex Link, Enumer. Pl. Hort. Berol. I (1809) p. 144, emend. Korsh. in Acta Horti Petrop. XII (1893) p. 328.

As Link describes this species as having ovate-lanceolate leaflets and reddish flowers, he certainly had not a pure form as type specimen, but a hybrid with *S. officinalis*. The pure species, showing no characteristics peculiar to *S. officinalis*, is represented by the var. *parviflora* described by Maximovicz

[1] Freyn apparently realized that such a simple idea as separating the forms into those two varieties characterized by long spikes and long leaflets and short spikes and short leaflets respectively could not hold good. He writes loc. cit.: »Es gibt jedoch auch Formen, bei denen schmale, lange Aehren mit breiten Blättern und dicke Aehren mit schmalen Blättern combiniert sind».

(Prim. Fl. Amur. p. 94 et Mél. Biol. IX p. 153) and later regorded by TAKEDA as a separate species *S. parviflora* (Journ. Linn. Soc. Bot. LXII 1914 p. 462). For characteristics of this plant see under *S. officinalis* × *tenuifolia*. Only very few Kamtchatka specimens approach the pure form and practically none of those examined by me can be said to be quite destitute of characteristics derived from *S. officinalis*.

The purest specimens are the following:

South Kamtchatka: Opala R. RUBINSKI 1909; Natchika KOMAROV 1908 (Hb. Berol.); Korjaka KOMAROV 1908.

East Kamtchatka: Petropavlovsk Aug. 14th 1920 HN No. 876, do. July 28th 1920 NOVOGRABLENOF; between Petropavlovsk and Avatcha volcano 300 m. Aug. 6th 1920 HN No. 757.

»Kamtchatka»: RIEDER (sub *S. canadensis*).

Our plant has sometimes been referred to the Eastern American species *S. canadensis*, from which, however, it differs considerably, not only in the form of the leaves, but also in the spikes, which in all specimens observed by me begin to flower from the top (as well in the pure form as in the hybrids) and not from the base, like those of *S. canadensis*. *S. canadensis* and *S. sitchensis* are often reported from Japan, but as they do not occur in Kamtchatka, which lies between their home-country and Japan, it seems probable that such forms should be referred to *S. officinalis* × *tenuifolia*.

Type of distribution: Eastern Asiatic.

Geographical area: from Dahuria, Ochotsk and northern Kamtchatka southwards to northern China, Kiang-su, Corea and Liu-Kiu Islands. Hybrids with *S. officinalis* are common, at any rate in the northern and western border of the area.

Rosa.[1]

To judge from the literature on the subject the genus *Rosa* is very multiform and presents rather complicated conditions in Kamtchatka as well as in most other northern countries. As a matter of fact, the conditions, when studied in nature, seem to be comparatively simple. The Japanese species *R. rugosa* occupies the shore of at least the southern part of the country, being especially common on the low sandy »koshka» of the western coast. It seems to be strictly confined to a narrow strip along the shore here as well as in Japan. The lowlands of the whole country are covered with the form of *R. davurica* which C. A. MEYER has described as *R. amblyotis*, while *R. acicularis* occurs only in the northern half of the peninsula. However, the hybrids between *R. rugosa* and *R. davurica*, that occur in the southern part in those districts close to the shore where both parent-species occur or inconsiderably more

[1] The classification of the material of this genus collected by the Swedish Kamtchatka Expedition was made by Professor G. TÄCKHOLM, Stockholm.

inland, caused most confusion. They have usually been taken as a separate species — *R. kamchatica* VENT. — or as different varieties of *R. rugosa*.

525. ***Rosa acicularis*** LINDL., Ros. Monogr. (1820) p. 44 tab. 8.

Central Kamtchatka: Milkova PROTOPOPOF 1908; »Malaja Nikkolki» near Shtchapina KOMAROV 1909; »Bolshaja Nikkolki» KOMAROV 1909 (Hb. Berol.); Kosyrevsk•PROTOPOPOF 1909.

Although no specimens were collected in northern Kamtchatka, it seems probable that the area of this spécies in Central Kamtchatka is connected towards the north with its large Siberian area.

Type of distribution: Circumpolar.

Geographical area: Europe: from Sweden (one locality in the N. E. part), central Finland and northern Russia in the Urals southwards to Ufa and Orenburg. Asia: at Obi from about 67° N. lat., at Yenisei from about 70° N. lat. throughout the wooded country to Kolyma and Central Kamtchatka, southwards to Semiretchensk prov., northern Mongolia, northern China (Chili), Ussuri and Yezo (not known from the northern Kuriles or southern Kamtchatka). America: acc. to RYDB. from Alaska to northern New York, southwards to Wyoming and Michigan.

526. ***Rosa davurica*** PALL., Fl. Ross. I: 2 (1784) p. 61 (*dauurica*).

CREPIN, Prim. Monogr. Ros. III p. (38) 332. — »*Rosa non spinosa calicis foliis indivisis*» GMEL., Fl. Sib. III p. 177 quoad pl. Kamtsch. — *Rosa alpina* PENNANT, Arct. Zool. (1784) p. CXV. — *Rosa canina* PALLAS, Fl. Ross. I: 2 p. 60 quoad pl. Kamtsch.; GEORGI, Beschreib. III: 4 p. 1026 quoad pl. Kamtsch.; LANGSDORFF, Bemerk. p. 231; LEDEB., Fl. Ross. II p. 75 quoad pl. Kamtsch. — *Rosa camtschatica* CHAM. in Linnaea VI (1831) p. 590; ERMAN, Verzeichn. p. 114. — *Rosa Gmelini* LEDEB., Fl. Ross. II p. 75 saltem quoad pl. Kamtsch. — *Rosa cinnamomea* LEDEB., Fl. Ross. II p. 76 quoad pl. Kamtsch. pro parte. — *Rosa amblyotis* C. A. MEYER in Mém. Ac. Imp. Sc. St. Petersb. Ser. VI Sc. Nat. T. VI Bot. (1849) p. 30; CREPIN, Prim. Monogr. Ros. III p. (38) 332; KOM., Voy. Kamtch. pp. 12, 40, 455 et Fl. Kamtsch. p. 331; HULTÉN, Fl. Kamtch. I p. 24. — *Rosa rugosa* DITMAR, Reisen II p. 81. — »*Rosen*» DITMAR, Reisen I pp. 108, 296, 422, 447, 551, 687, 715.

South Kamtchatka: Kurile Lake in meadow noted by HN; between Javina and Kochegochek noted in A. 91, A. 92 (possibly *R. davurica* / *rugosa*); upper Unkanakchek R. in *Betula* forest noted by HN; Kusetenek R. Aug. 17th 1922 HN No. 4286 (A. 191); S. of Golygina village in meadow noted by HN; upper Ksudach R. in meadow noted by HN; middle Ksudach R. Aug. 6th 1921 HN No. 2735 (A. 86); upper Shadutka R. in meadow and *Betula* forest noted by HN; upper Savan R. noted in A. 79; upper Opala R. near Assatcha in *Betula platyphylla—Thalictrum—Carex* ass. and in meadow noted by HN; do. noted in A. 183, A. 184, A. 185; the hot spring at upper Opala R. Aug. 4th 1922 HN No. 4158 (A. 182); N. W. of Opala volcano noted in A. 68, A. 69; upper Abshen R. noted by HN; junction of Tolmachovaja rivers noted in A. 157; middle Karymchina R. in meadow noted by HN; lower Karymchina

R. noted in A. 124 and A. 151; the mouth of Balaganchik R. noted in A. 152, A. 153, A. 154; lower Bolshaja R. Aug. 23rd 1921 Hn No. 2918 b (A. 107); Danilina R. noted in A. 61; S. E. of Bolsheredsk July 13th 1921 Hn No. 2119 (A. 56); E. of Bolsheredsk noted by Hn; between Bolsheredsk and Apatcha Aug. 30th 1921 Hn No. 2979 (A. 113); the hot springs at Siku R. noted in A. 122 and in *Betula* forest; between the hot springs at Siku R. and Apatcha noted in A. 150; Paratunka Komarov 1908; the mouth of Paratunka R. Aug. 11th 1920 Hn No. 829; Natchika Komarov 1908; Savoiko Komarov 1908, do. July 7th 1920 Hn No. 251 b, do. July 10th 1928 W. Eyerdam.

East Kamtchatka: Petropavlovsk 165 m. Aug. 16th 1920 Hn No. 973; between Petropavlovsk and Avatcha volcano 350 m. Aug. 23rd 1920 Hn No. 1074 and 1123 (A. 7, A. 17, A. 18, A. 23); the mouth of Semjatchik R. acc. to Ditmar loc. cit.; Lake Kronoki Komarov 1909; Lake Assabatch Aug. 15th 1925 Malaise No. 479; Nishne Kamtchatsk Bezais 1908.

Central Kamtchatka: Milkova Komarov 1909; Kirganik Komarov 1909; Shtchapina Komarov 1909, do. July 18th 1921 Hn No. 3461; Kunchekla Protopopof 1909; Anauna R. Aug. 20th 1926 Malaise No. 147; Klutchi Afanasejev, do. Bezais 1908.

West and North Kamtchatka: Tigil »Ad Erman Ad. v. Ch. *Rosa kamtschatica* Vent. Linnaea 2 p. 35» (Hb. Berol., det. Crepin *R. amblyotis* C. A. Mey.).

»Kamtchatka»: Kastalsky.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 68, A. 69, A. 79, A. 86, A. 91, A. 92, A. 182, A. 185, A. 191); Sparse (A. 107, A. 184); Scattered (A. 153).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 124); Sparse (A. 61, A. 113, A. 122, A. 151); Abundant (A. 56).

In *Betula platyphylla—Thalictrum—Carex* ass.:
Sparse (A. 152, A. 154, A. 157).

In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 7, A. 17, A. 18, A. 23, A 150, A. 183).

In South Kamtchatka *R. davurica* is very common, occurring in the meadows and *Betula* forests of the lowlands. It is especially abundant in and characteristic of the high-grown *Angelica ursina*-meadows. It flowers in July.

Our plant is not very variable. It is at once recognized by its practically smooth branches armed only with the large opposed stipular prickles, and leaves with 7 acutish leaflets. It was described by C. A. Meyer as *R. amblyotis*, but even Crepin loc. cit. doubts whether this is a separate species and regards it as a form of *R. davurica*. In the material from which C. A. Meyer described *R. amblyotis* were also probably included specimens of *R. davurica* × *rugosa*

(which is common at Petropavlovsk where most earlier specimens were collected), as he says that it comes midway between *R. cinnamomea* and *R. rugosa* (C. A. MEYER loc. cit. p. 7). It seems hardly possible to separate our plant specifically from *R. davurica* and it is therefore here taken as the eastern representativ of that species.

The geographical area is difficult to state. CREPIN believes that true *R. cinnamomea* does not occur in Siberia. If this is correct probably all Siberian material of the *R. cinnamomea*-type should be referred to *R. davurica*, which in that case would be distributed throughout the forest region of Siberia. Even CREPIN questions whether the species occurs in America. A closely related form from the Aleutian Islands he refers with some hesitation to a separate species *R. aleutensis* CREP. (Cfr. CREPIN Prim. Monogr. Ros. III p. (49) 410). To which species the plant reported by FEDTSCHENKO in Fl. Îl. Comm. p. 56 as *R. cinnamomea* belongs it is impossible to say, since, as far as I know, no herbarium specimens of the plant exist.

Type of distribution: Eastern Asiatic.

Geographical area: Western limit unknown. Reported from Vilju district, Ochotsk and Kamtchatka southwards to Dahuria, Manchuria and Saghalin. ?America.

Rosa davurica × *rugosa.*

Rosa kamchatica VENT., Descr. plant. nov. Jard. Cels. tab. 67; LINDL., Ros. Monogr. p. 6; CHAM. in Linnaea II (1827) p. 35; HOOK. & ARNOTT in Beechy's Voy. p. 114; CREPIN, Prim. Monogr. Ros. II p. (51) 167. — *Rosa cinnamomea* LEDEB., Fl. Ross. II p. 76 quoad pl. Kamtsch. pro parte. — *Rosa rugosa* var. *γ Lindleyana* C. A. MEYER in Mém. Ac. Imp. Sc. St. Petersb. Sér. VI Sc. Nat. T. VI Bot. (1849) p. 34, *δ Chamissoniana* p. 34, *ε Ventenatiana* p. 35, *ζ subinermis* p. 36 quoad. pl. Kamtsch.; Cfr. CREPIN, Prim. Monogr. Ros. III p. (41) 335. — *Rosa kamtschatica β nitens* LINDL. in Bot. Regist. tab. 824.

South Kamtchatka: Between Javina and Kochegochek Aug. 13th 1921; middle Kidipalok R. noted by HN; between Kochegochek and Golygina Aug. 9th 1921 HN No. 2781; Toporkoff Island (Sarannaja Bay) Aug. 15th 1920 HN No. 896; Savoiko July 25th 1928 W. EYERDAM.

East Kamtchatka: Petropavlovsk Aug. 17th 1920 HN No. 928, do. Aug. 20th 1922 NOVOGRABLENOF (Hb. Holm.); between Petropavlovsk and Avatcha volcano 350 m. Aug. 22nd 1920 HN No. 1032 (only slightly influenced by *R. rugosa*).

Specimens of this hybrid often differ widely from each other. However, they all show, usually very prominently, the characteristics of both the parent species. From *R. rugosa* they have the pubescence of the stems and prickles (in a very different degree in different specimens), the bristly stem and the more rounded leaflets and from *R. davurica* the large opposed stipular prickles, the dark-coloured, sometimes almost glabrous stem, and the smaller flowers. It was only found near the shore, the only specimen collected somewhat more inland (HN No. 1032) being but slightly influenced by *R. rugosa*. There can hardly be any doubt that the specimens belong to the above hybrid.

527. ***Rosa rugosa*** Thunb., Fl. Jap. (1784) p. 213.

C. A. Meyer in Mém. Ac. Imp. Sc. St. Petersb. Sér. VI Sc. Nat. T. VI Bot. (1849) p. 32 (quoad var. *α Thunbergiana* et *β ferox*); Ditmar, Reisen II p. 81; Crepin, Prim. Monogr. Ros. III p. (41) 335 cfr. II p. (52) 168; Yabe & Yendo, Fl. Shimushu p. (186); Kom., Voy. Kamtch. pp. 353, 393, 455; Kudo, Fl. Paramush. p. 125; *Rosa spinosissima* Langsdorff, Bemerk. p. 231. — *Rosa Kamtschatica* Redout., Roses I p. 47 tab. 12. — *Rosa ferox* Lindl., Ros. Monogr. p. 3 excl. pl. Caucas. — *Rosa cinnamomea* Ledeb., Fl. Ross. II p. 76 quoad pl. Kamtsch. pro parte. — *Rosa Kamtschatica β ferox* Sér. in DC., Prodr. II p. 607.

Northern Kuriles: Paramushir C. Taro 1892, S. Yokoyama 1893, Kudo 1920 all acc. to Kudo loc. cit.; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka Aug. 22nd and 24th 1847 Vossnesensky (det. Crepin *R. rugosa* var. *ferox*), do. west coast June 19th 1920 Hn No. 47, do. June 24th 1920 Hn No. 131; N. of the mouth of Ozernaja R. noted by Hn; between the mouths of Golygina and Opala rivers Aug. 15th 1921 Hn No. 2878; Lake Sterbot Rubinski 1909; between Bolsheredsk and Golygina Rieder 1831 (*R. rugosa* var. *ferox* det. Crepin); Paratunka Stubendorff; Bogatyrjovka July 16th 1920 Hn No. 458.

East Kamtchatka: Petropavlovsk acc. to Kom. loc. cit.; Kalashtyrka acc. to Kom. loc. cit.; Haliger acc. to Kom. loc. cit.; the mouth of Shupanova R. acc. to Kom. loc. cit.

»Kamtchatka»: Peters, Rieder; Tigil Levitzky — the place is not mentioned in the original label but was added later and the report is very doubtful.

In South Kamtchatka this plant is common especially in the meadows of the low sandy western coast, but it also occurs in corresponding localities on the eastern coast. Here as well as in Japan it is confined to the shore. It is a shrub about half a metre high, often flowering abundantly. The flowers are dark-carmine and very large (8—12 cm. in diametre). The flowering stems are tomentose and very strongly armed. It flowers in July and the beginning of August.

Kamtchatka specimens belong to var. *ferox* (Lindl.) C. A. Mey., which is considered by Crepin to be the typical form of *R. rugosa*.

Type of distribution: Asiatic Pacific.

Geographical area: From Ochotsk and southern Kamtchatka southwards to Corea, northern China (Shantung) and northern Yezo. Cultivated and occasionally escaped from cultivation in Europe and N. America.

528. ***Prunus Padus*** L., Sp. pl. ed. I (1753) p. 437.

Krascheninn., Kamtsch. p. 100; Pall., Fl. Ross. I: 1 p. 16; Pennant, Arct. Zool. (1784) p. CXV; Georgi, Beschreib. III: 4 p. 1001; Langsdorff, Bemerk. p. 229; Cham. in Linnaea VI (1831) p. 590; Erman, Verzeichn. p. 64; Ledeb., Fl. Ross. II p. 8; Ditmar, Reisen I pp. 374, 394, 397, 429, 737, Reisen II p. 102; Kom., Voy. Kamtch. p. 455. — »*Scheromka*» Kittlitz, Denkw. II p. 32. — »*Padus*» Kittlitz, Denkw. II pp. 309, 321.

South Kamtchatka: Avatcha R. Rieder 1833; Savoiko Komarov 1909, do. July 7th 1920 Hn No. 252, do. June 20th 1921 Hn No. 1779 b.

Central Kamtchatka: Rare above Vershne-Kamtchatsk acc. to Ditmar loc. cit. p. 429; Milkova Protopopof 1908; Mashura Komarov 1908; Kitilgina R. acc. to Ditmar loc. cit. p. 737; Shtchapina Grinop; Tolbatchik acc. to Ditmar loc. cit. pp. 394, 397; Klutchi Vossnesensky Sept. 4th 1848, do. acc. to Ditmar loc. cit. p. 374, do. Bezais 1908; do. Afanasejev 1909, do. June 19th 1921 Hn No. 3360 (Malaise) and 3369 (Malaise).

Kamtchatka: »Mit essbaren Früchten Kschta niedrig Ad Erman Cham.» Hb. Acad. Petrop., »Petropavlovsk» Mertens (uncertain); Tigil Levitzky 1848 (the place is not given in the original label), Peters 1831, Rieder 1831.

In South Kamtchatka the species seems to occur only on the northern border. It thus belongs to the group of plants that prefer a more continental climate. The specimens agree closely with the Scandinavian and do not belong to var. *borealis* Schueb. Hn No. 3360 is a very peculiar form, without developed leaves at the time of floration and with short stiff upright racemes. The filaments are only about 2,5 mm. long and the rounded petals about 4,5 mm. Acc. to Malaise it was collected from branches which had been cut off in the winter and on which flowers had developed in the spring. The old Kamtchadal name of *P. Padus* was acc. to Kittlitz »Kaëtaltsch».

Type of distribution: Eurasiatic.

Geographical area: Europe: from northern Scandinavia, southern Kola and northern Russia, southwards to northern Spain, northern Italy, northern Balkans and Caucasus. Asia: from the Urals throughout Siberia, in the forest belt to Kolyma and Saghalin, southwards to Asia Minor, Semipalatinsk prov., Mongolia, northern China, Corea and Yezo (except southernmost part), also in central Kamtchatka (not known from the Kuriles or from southernmost Kamtchatka).

Leguminosae Juss.

529. ***Thermopsis fabacea*** (Pall.) DC., Prodr. II (1825) p. 99.

Ledeb., Fl. Ross. I p. 511; Yabe & Yendo, Fl. Shimushu p. (186); Kom., Voy. Kamtch. p. 415 et Fl. Penins. Kamtsch. I p. 333; Kudo, Fl. Paramush. p. 126. — »*Sophora foliis ternatis, spica verticillata*» L., Amoen. Acad. II ed. I p. 374 (Pl. Rar. Kamsch. p. 17) (saltem quoad »*α* Stipulis subrotundis obtusissimis retusis» p. 375 et 18). — *Sophora lupinoides* L., Sp. pl. ed. I (1753) p. 374 pro parte; Penn., Arct. Zool. (1784) p. CXV. — »*Lotus leguminibus binis .... Huius plantae varietas ....*» Gmel., Fl. Sib. IV p. 33 in nota. — *Sophora fabacea* Pall., Spec. Astrag. p. 122. — *Lupinus* Cham. in Linnaea VI (1831) p. 548. — »*Lupinus—?*» Erman, Verzeichn. p. 64; Cfr. Ledeb., Fl. Ross. I p. 512.

Northern Kuriles: Paramushir C. Taro 1892, S. Yokoyama 1893, T. Matsubara 1915, Kudo 1920 all acc. to Kudo loc. cit.; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka collected by cossacks in 1909 (Hb. Hort. Petrop.); Kurile Lake at the estuary of the river July 28th 1922 Hn

No. 4447, do. in meadow close to old habitations noted by Hn; Ozernaja R. 30 verst from the mouth Rubinski 1909; the mouth of Ozernaja R. Bezais; Ozernaja village noted by Hn; lower Ozernaja R. noted in A. 96; Javina village noted by Hn; the shore of Golygina R. Vossnesensky 1847; lower Golygina R. at an old habitation Aug. 7th 1921 Hn No. 2744; Golygina village noted by Hn; Lake Sterbot noted in A. 215; between the mouths of Opala and Bolshaja R. here and there noted by Hn; Sykovaja village noted in A. 217; near the mouth of Bolshaja R. July 5th 1921 Hn No. 1936; 2 and 4 verst N. of the Russian fishery at the mouth of Bolshaja R. noted by Hn; Haikovaja village Bezais 1909 (Hb. Berol.), do. noted by Hn; Amchegatcha R. Rubinski 1909; »from Cape Chadutka to Lopatka and along the southern coast to Bolsheredsk» Rieder 1831.

West and North Kamtchatka: The right shore of Teschman R. (S. of Vorovskaja) 4 versts from the mouth Zelenin 1909; Kompakovaja Zelenin 1908.

»Kamtchatka»: Petropavlovsk Mertens (probably incorrect); Tigil Levitzky (the place is not given in the original label and the report is therefore very unreliable); Rieder (Hb. Berol.); Peters 1831.

Noted in the following associations:
In *Thalictrum—Sanguisorba—Carex* ass.:
Sparse (A. 96).
In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Single (A. 217); Sparse (A. 215).

This plant is said to occur only on the maritime shore. In Kamtchatka, however, it occurs also inland, although it is more common on the sandy »koshka» of the west coast. Inland it always occurred close to the pits that mark the site of the old villages dating from the Stone Age. This was the case as well at Kurile Lake as by the lower Golygina river, and also on the western coast. It seems probable therefore that the dispersion of the plant in Kamtchatka has been, at least in part, anthropochor, and one might doubt whether the plant is indigenous there or not.

Th. fabacea flowers in July. It belongs to the small group of plants with a pronounced southwesternly distribution within our area.

It is with some hesitation that I retain the name *Th. fabacea* for this plant. It was first described by Linnaeus in Amoen. Acad., but to the description is added the remark that the plant occurs in two varieties viz.: »α Stipulis subrotundis obtusissimis retusis. Floribus in spica saepius alternis magis pedicellatis» and »β Stipulis ovato-oblongis acutiusculis tribus in singulo spicae verticillo. Bracteis triphyllis scapum spicae ambientibus.» In Sp. pl. Linnaeus does not repeat this distinction but refers both to *Sophora lupinoides*. Pallas in Spec. Astrag. so interpreted these varieties that he took var. α to be his *Sophora fabacea* and var. β to be *Sophora lupinoides* of Linnaeus. If this interpretation is correct our plant must be named as above and the plant now usually named *Thermopsis lanceolata* must be named *Th. lupinoides*.

On the other hand, it seems not improbable that both *α* and *β* belong to our plant, as LINNAEUS does not mention anything about the difference in leaf-form, which is so pronounced for the species *Th. lanceolata* and *Th. fabacea*, and in that case our plant must be named *Th. lupinoides*.

Type of distribution: Asiatic Pacific.

Geographical area: From S.W. Kamtchatka, Ochotsk and Saghalin southwards along the coast to Liu-Kiu Islands and Fukien. In America closely related species.

Thermopsis lanceolata R. BR.

DC., Prodr. II p. 99; LUNDSTR. in Acta Horti Bergiani V (1914) p. 78.

The report of this species from Kamtchatka was founded on LINNAEUS' report of »*Sophora foliis ternatis, spica verticillata . . . β*» in Amoen. Acad. II ed. I p. 375 which was interpreted to mean *Th. lanceolata*. It must be excluded from the flora of our area.

Medicago denticulata WILLD., Sp. pl. III (1800) p. 1414.

FEDTSCH., Fl. Îl. Comm. p. 49.

Commander Islands: Bering Island STEJNEGER acc. to FEDTSCH. loc. cit. The plant has probably been cultivated on Bering Island.

Trifolium hybridum L., Sp. pl. ed. I (1753) p. 766.

East Kamtchatka: Petropavlovsk Aug. 28th 1922 P. T. NOVOGRABLENOF.

The plant was certainly cultivated at the experimental farm at Petropavlovsk and has occasionally escaped from cultivation.

Trifolium lupinaster L.

MIYABE, Fl. Kuril. p. 224.

The source of the report of this plant from Kamtchatka is unknown to me. It is also reported from the northern Kuriles by KUDO in the table p. 264 in Japanese Journ. Bot. II (1925). The plant may be expected in the southernmost part of our area but is not with certainty known to occur within it.

Trifolium medium (L.) HUDS.

CHAMISSO in Linnaea VI (1831) p. 545; ERMAN, Verzeichn. p. 64; LEDEB., Fl. Ross. I p. 547.

»Kamtchatka»: RIEDER (Hb. CHAM., Hb. Acad. Petrop.).

The plant certainly occurred occasionally, either cultivated or escaped from cultivation.

Trifolium pratense L., Sp. pl. ed. I (1753) p. 767.

East Kamtchatka: Petropavlovsk RUBINSKI 1908, do. Aug. 8th 1921 HN No. 3636 (P. T. NOVOGRABLENOF).

The plant was cultivated at the experimental farm at Petropavlovsk and occasionally escaped from cultivation.

530. ***Trifolium repens*** L., Sp. pl. ed. I (1753) p. 767.

Fedtsch., Fl. Îl. Comm. p. 49; Kom., Voy. Kamtch. p. 453.

South Kamtchatka: Bolsheredsk Rubinski 1909, do. noted by Hn; Apatcha village noted by Hn; Paratunka village Komarov 1908; near Natchika Rubinski 1908; Natchika village noted by Hn; Savoiko July 9th 1920 Hn No. 357; between Natchika and Korjaka on the path noted by Hn; Korjaka village noted by Hn.

East Kamtchatka: Petropavlovsk Mertens, do. Dobrotvorsky 1881, do. Komarov 1908, do. June 14th 1921 Hn No. 1707, do. June 16th 1922 P. T. Novograblenof; between Petropavlovsk and Avatcha volcano 10 km. from Petropavlovsk on the path noted by Hn.

Commander Islands: Copper Island Stejneger acc. to Fedtsch. loc. cit.

Central Kamtchatka: Sharomsk Komarov 1909; Milkova acc. to Kom. loc. cit.; between Kirganik and Mashura acc. to Kom. loc. cit.; Mashura Aug. 9th 1921 Hn No. 3518 (Malaise); Tolbatchik Bezais 1908; the mouth of Tolbatchik R. Komarov 1908; Ushki Protopopof 1909.

»Kamtchatka»: Kusmischeff, Rieder.

This plant has been introduced into our area. It does not appear as yet to have reached the more distant villages; thus it is absent in the villages on the southern westcoast. It occurs only around the villages and on the paths.

Type of distribution: Circumpolar.

Geographical area: A native of Europe, cultivated and naturalized throughout Europe, Asia and N. America.

Astragalus alopecuroides L.

Pennant, Arct. Zool. (1784) p. CXVI; Georgi, Beschreib. III: 5 p. 1183. — »*Astragalus capitulis oblongis* ....» L., Amoen. Acad. II ed. I p. 359 (Pl. Rar. Kamtsch. p. 27).

The plant should be excluded from the flora of our area.

531. ***Astragalus alpinus*** L., Sp. pl. ed. II (1763) p. 1070.

Pennant., Arct. Zool. (1784) p. CXVI; Pallas, Spec. Astrag. p. 41; Georgi, Beschreib. III: 5 p. 1185; Ledeb., Fl. Ross. I p. 601 (saltem pro maxima parte). — »*Astragalus caulescens procumbens* . . .» Gmel., Fl. Sib. IV p. 45. — *Astragalus salicetorum* Komarov in Fedde, Rep. Spec. Nov. XIII (1914) p. 230.

South Kamtchatka: the hot springs at Bannaja Rubinski 1909; Paratunka Komarov 1908 (Hb. Berol.); Mikisha Komarov 1908; Nikolajevsk Komarov 1908; Grishkinoj R. (Lake Natchika) Komarov 1908; Mt. Taburett Rubinski 1909.

East Kamtchatka: Avatcha volcano Perfiljef 1911, do. 675 m. July 30th 1920 Hn No. 606, do. 1300 m. noted by Hn; Cape Kozlof June 23rd 1923 Malaise; Klutchevskaja volcano Kozlovski 1909; do. 3600 feet Bezais

1908; Ploskaja volcano »pervaja va dolu sopotchka» PROTOPOPOF 1909; Ustj Kamtchatka Aug. 26th 1925 MALAISE No. 479 and 480.

Central Kamtchatka: Malka KOMAROV 1909; Ganala DYBOVSKY; Ganalski Vaktal R. PROTOPOPOF 1908; Ganalski Vystraki July 17th 1924 P. T. NOVOGRABLENOF; Kamtchatka Vershina GRINOP 1909; Kresti July 5th 1921 HN No. 3412 (MALAISE); Klutchi BEZAIS 1908 (Hb. Berol., Hb. Holm.), do. Monastirski ostrov BEZAIS 1908 (partly sub *A. salicetorum*), do. AFANASEJEV 1909.

West and North Kamtchatka: Krutugorovaja ZELENIN 1908; between Tigil and Sedanka BEZAIS 1908; shore of Vojampolka R. LEVITZKY 1848; Pallan ZELENIN 1911, do. June 27th 1927 LONGINOFF; Karaginsk Island MERTENS.

»Kamtchatka»: East coast RIEDER 1831; the Kamtchatka valley DYBOVSKY 1879.

A. alpinus was not observed in the southernmost part of our area. It occurs in several forms from the low-grown, strongly hairy high-alpine form to stout, large-leaved, less hairy lowland forms (swept down by the rivers). One of these latter forms was described by KOMAROV loc. cit. as *A. salicetorum*. KOMAROV described this plant as having free stipules. This, however, is not the case, the stipules being connate and quite similiar to those of the common *A. alpinus*, from which his species differs, as far as I can see, only in having unusually long calyx-teeth and at least some of the pods white-hairy. KOMAROV gives the following characteristics as distinguishing *A. salicetorum* from *A. alpinus* »pube nigro defecto, dentibus calycinis multo longioribus, carina alas subaequante et bracteis minoribus». The length of the calyx-teeth varies considerably, as can be easily proved on an examination of a larger amount of material of the species, and specimens with equally long teeth are also to be found in Scandinavia. The colour of the hairs as well on the pods as on the stems varies between black, green and white, and pods with the dorsal part black hairy and the ventral side greenish or white-hairy are not uncommon. Entirely white-haired specimens are more rare, but occur also in Scandinavia (for instance var. *dilutus* NORM.).

The mutual length of the keel and the wings is about the same as in *A. alpinus* and the bracts are 2 mm., a very common size for the bracts of *A. alpinus*. As, therefore, I can find no essential difference between this plant and *A. alpinus*, I must reduce *A. salicetorum* to a synonym of *A. alpinus*.

Type of distribution: Circumpolar, arctic-alpine.

Geographical area: As *A. alpinus* and *A. arcticus* are often associated, it is difficult to give the geographical distribution of those forms separately. *A. alpinus* occurs in Europa in the mts. of Scandinavia, Scotland, the Pyrenees, the Alps and the Carpathians. It seems doubtful whether it also occurs in northern Russia. Asia: throughout Siberia to Chukch Penins. and Kamtchatka, southwards to western Tibet, northern Mongolia, Udskoj distr. and southern Kamtchatka. America: acc. to FERNALD from Alaska 72° N. lat.

to Baffin Land 73° N. lat., southwards to New Mexico 36° N. lat. and (var. *Brunetianus* Fern.) Newfoundland 49° N. lat.

532. ***Astragalus arcticus*** Bunge in Mém. Ac. Imp. Sc. St. Petersb. Sér. VII T. XV (1869) p. 27.

Astragalus Atlasovi Komarov in Fedde, Rep. Spec. Nov. XIII (1914) p. 229.

Central Kamtchatka: Sources of Kashkan R. near Pushtchina Komarov 1909.

The specimens from Pushtchina closely agree with the arctic plant known as *A. arcticus* Bunge, which is often taken to be a variety or even a form of *A. alpinus*. As it is comparatively constant and has a geographical area of its own, I think that the lowest rank it can be given is that of a subspecies. It is recognized by the smaller keel being about as broad as the wings and considerably shorter than the standards, as well as by its dark purplish-blue flowers.

Komarov compares his *A. Atlasovi* with *A. oroboides* Hornem., from which plant, however, it is at once distinguished by its stipules, which are clearly connate and not, as stated in the diagnosis, free.

Type of distribution: Eurasiatic.

Geographical area: Known from northern Scandinavia, Finland and Kola Penins., from Samoyede Land, Nova Zembla, the mouth of Yenisei, arctic eastern Siberia and Kamtchatka.

533. ***Astragalus frigidus*** (L.) Bunge in Mém. Ac. Imp. Sc. St. Petersb. Sér. VII T. XV (1869) p. 28.

subsp. ***paviflorus*** (Turcz.) nov. comb. (Ledeb. pro var.).

Astragalus secundus Kudo, Fl. Paramush. p. 126.

Northern Kuriles: Paramushir T. Sakurai 1910, Kudo 1920.

South Kamtchatka: Cape Lopatka east coast June 22nd 1920 Hn No. 84 (undeveloped but probably belonging to this species); »between Cape Lopatka and Ozernaja common» Riedeer; »Perisheik» (Ozernaja) Rubinski 1909; N. of Ozernaja village noted by Hn; N. of Javina village in meadow noted by Hn; the seashore between Javina and Kochegochek Aug. 13th 1921 Hn No. 2871; upper Kusingen R. in meadow noted by Hn; W. of the mouth of Golygina R. in heath noted by Hn; upper Ksudach R. noted by Hn; the pass between Savan and Shadutka R. in heath noted by Hn; upper Savan R. 250 m. July 31st 1921 Hn No. 2535 a (A. 79); Assatcha Mts. the N. W. slope in heath noted by Hn; do. the N. slope in alpine meadow noted by Hn; Lake Tolmachovaja noted by Hn; the junction of Tolmachovaja rivers noted in A. 157; the mouth of Balaganchik R. July 7th 1922 Hn No. 3864; Lake Natchika Aug. 4th 1924 P. T. Novograblenof; Natchika Komarov 1908; Poperochnaja R. Komarov 1908 (Hb. Berol. sub *A. secundus*); Savoiko July 27th 1928 Malaise.

»Kamtchatka»: Dybovsky 1879.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 79).

In *Betula platyphylla—Thalictrum—Carex* ass.:
Single (A. 157).

In South Kamtchatka, especially in its southern part (S. of Opala river), this plant is fairly common in the meadows and sometimes also in the heaths. On the northern border of this district it occurs occasionally, but further to the north it is absent. It flowers from the beginning of July to the middle of August.

Our plant exactly matches the species described by TURCZANNINOV in Bull. Soc. Nat. Mosc. 13 (1840) p. 66 under the name of *Phaca parviflora*, of which I have seen a type specimen. The chief difference between it and *A. frigidus* lies in the proportions of the flower. The wings, especially, are much narrower and longer-stipitated than in the European type (the stipe of the wings about $8 \times 1/2$ mm., in the European plant about 7×1 mm.); also the blade of the wings is narrower in var. *parviflorus*. The apical, broader part of the keel is also considerably longer and narrower than in typical *A. frigidus*. The pods are black- or white-hairy and somewhat shorter-stipitated, and the stipules seem on an average to be somewhat more blunt. As the above-enumerated characteristics seem to be comparatively constant, our plant must be regarded as an eastern Asiatic representative of *A. frigidus*, but it seems hardly possible to regard it as a separate species. BUNGE in Mém. Ac. Imp. Sc. St. Petersb. Sér. VII T. XV (1869) p. 28 identifies TURCZANNINOVS species *Phaca parviflora* with *Astragalus secundus* DC. As, however, I have not seen authentic material of that plant and as our plant is not closely conform to its description (it is said to be procumbent and glabrous, to have 4—5 pairs of leaflets, glabrous pods, and to resemble *A. glycyphyllus* — none of them characteristics of our plant) I use the name of TURCZANNINOV, which in any case is correct.

Type of distribution: Circumpolar.

Geographical area: Europe: From northernmost Scandinavia, Kola penins. and the northern Urals southwards in the mts. to central Scandinavia. Also in Scotland, the Alps, the Carpathians and Siebenburgen. Asia: in different races from lower Obi and Yenisei eastwards to Chukch penins., southwards in the mts. to the Western Himalayas, Semiretchensk prov., northern Mongolia, Transbaikalia, Ochotsk and the mts. of Honshu (to the east subsp. *parviflorus*). America: var. *americanus* WATTS. acc. to FERNALD from Yukon 65° N. lat. to Gaspé Penins. 49° N. lat., southwards to Colorado 39° N. lat. and Gaspé Penins. 48° N. lat.

Astragalus ischigensis MAXIM. ined.

?»*Astragalus caulibus ramosis . . .*» GMEL., Fl. Sib. IV p. 44 quoad pl. Kamtsch. — ?*Astragalus Cicer* PENNANT, Arct. Zool. (1784) p. CXV; LEDEB., Fl. Ross. I p. 620 quoad pl. Kamtsch.

An *Astragalus* species named by MAXIMOVICZ *A. ischigensis* was, acc. to the labels, collected in Kamtchatka by KUSMISCHEFF and STEWART. It has broad inflated pods resembling those of *A. membranaceus* and probably yellowish flowers. Possibly it gave rise to GMELIN's report of *A. Cicer* from Kamtchatka. The specimens were not very closely studied as the above-mentioned old specimens may have been collected in the Kamtchatka province and not within our area (Compare HULTÉN, Fl. Kamtch. I p. 6). The report needs confirmation.

Astragalus physodes PALL.

PENNANT, Arct. Zool. (1784) p. CXVI; GEORGI, Beschreib. III: 5 p. 1186 (*physoides*). Cfr. LEDEB., Fl. Ross. I p. 659; — »*Astragalus acaulis, leguminibus inflatis subglobosis*» L. Amoen. Acad. II ed. I p. 359 (Pl. Rar. Kamtsch. p. 25).

The species must be excluded from the flora of our area.

534. ***Astragalus Schelichowii*** TURCZ. in Bull. Soc. Nat. Mosc. 13 (1840) p. 68.

»*Astragalus?*» CHAM. in Linnaea VI (1831) p. 547; — »*Astragalus —?*» ERMAN, Verzeichn. p. 64.

South Kamtchatka: 20 km. W. of Bolsheredsk July 6th 1921 HN No. 2009; Bolsheredsk S. of the river July 13th 1921 HN No. 2134.

Central Kamtchatka: Sharomsk KOMAROV 1909 (sub *A. uliginosus* var. *kamtschaticus* KOM.); Shtchapina KOMAROV 1909; Klutchi, Monastirski ostrov BEZAIS 1908.

West and North Kamtchatka: Chairusovaja NOVIKOF 1909; between Tigil and Sedanka BEZAIS 1909; »Kiesinseln des Tigilflusses ERMAN AD. v. CH.»

»Kamtchatka»: »Collector unknown» comm. BUNGE; Petropavlovsk MERTENS (the place is certainly not correct, sub *A. uliginosus* var. *kamtschaticus* KOM. det. KOMAROV).

In South Kamtchatka this plant was only observed on the banks of the Bolshaja river S. of the estuary of the Bystraja R. It seems probable that it followed the latter river down from its more compact area to the north.

Some of the specimens have white-hairy and not, as is usual, black-hairy pods, pedicel and stems (f. *pallens*). However, a close study shows that the stems are very often white-hairy, even in specimens with black-hairy pods. If, moreover, we consider that in different forms of other *Astragalus* species black or white hairs occur alternatively, for instance in *A. alpinus* and *A. frigidus* (see above), it seems clear that it is a characteristic of little taxonomical value. Such white-hairy specimens were, however, designated by KOMAROV in Hb. Hort. Petrop. as belonging to *A. uliginosus*, from which they are at once distinguished not only by their hairy pods but also by the absence of the very peculiar pair of »stipules» to be found close to the calyx on the pedicels of that species.

Type of distribution: Eastern Asiatic.

Geographical area: From Yakutsk distr., Kolyma and N. Kamtchatka southwards to Amgun R., Saghalin and S. Kamtchatka.

535. ***Astragalus umbellatus*** Bunge in Mém. Ac. Imp. Sc. St. Petersb. Sér. VII T. XV (1869) p. 29.

South Kamtchatka: Summit of Shalsan mts. Vossnesensky 1848.

Central Kamtchatka: Upper Gremushej R. near Korjatskaja volcano Komarov 1908 (Hb. Berol.); upper Kashkan R. Komarov 1908; the Ganala mts. Rieder 1831, do. July 18th 1924 P. T. Novograblenof (Hb. Holm.).

West and North Kamtchatka: Karaginsk Island Mertens.

This species is apparently rare in Kamtchatka.

It is sometimes taken to be a variety of *A. frigidus* (compare Aschers. & Graebn., Synops. Mitteleur. Fl. VI: 2 p. 764 and Lynge, Vasc. Pl. Novaja Zemlja p. 69). However, it is well distinguished from that species by the characteristics given by Bunge in the original diagnosis, and I have not seen intermediate forms.

Type of distribution: Asiatic—Western American.

Geographical area: Europe: Known from Kolgujef (Pohle), Nova Zembla and Vaigatch. Asia: along the North Coast to Chukch Penins. (Dickson Island Tolmatchev!, Preobrashenie Island Kjellman sub *Phaca frigida f. littoralis* Hook.!, the mouth of Lena R. N. H. Nilsson-Ehle!, Emma Bay!) southwards to Kamtchatka. America: Port Clarence (Kjellman sub *P. frigida f. littoralis*!). Hooker (Fl. Bor.-Amer. I p. 140) reports »*P. frigida γ littoralis*» from »Arctic shores westward of the Mackenzie river . . . to Cape Lisburne in Behring Straits.»

Oxytropis.

The genus *Oxytropis* is apparently very critical within our area, each group being represented there by several closely related species. Unfortunately the author did not realize this fact during the field work and the material of the genus collected is therefore too small. During the field work only four groups were recognized as being different and in the notes they were marked with numbers as follows: Group 1 (*O. nigrescens*, *O. longipes* and *O. kamtschatica*); Group 2 (*O. revoluta*); Group 3 (*O. erecta*, *O. litoralis*, *O. rubricaudex*); Group 4 (*O. Maydelliana*). Thus, the notes can be used only in the case of groups 2 and 4 and must be excluded in the other cases. It is clear, therefore, that the present treatment cannot, as in most other cases, give an idea of the distribution of these species within South Kamtchatka. Species of both groups 1 and 3 are however very common over the whole area.

As it will certainly be difficult, without access to the specimens cited, to identify the different species, a key to them — as they are understood by the author — is given below:

a) Spike 1—5-flowered; bracts not reaching as far as the base of the calyx-teeth.

b) Stipules comparatively firm, with raised veins, glabrous or sparsely long-hairy on the outside (in age glabrescent), often ciliated in the margin, free from each other; bracts green, at least in the apex; spike 1—3-flowered.

c) Stipules often reddish in the apex, rounded or somewhat prolonged, blunt (fig. 13 c, d); margin of the leaflets distinctly rolled back; pods long-stipitated within the calyx . . . . . *O. revoluta*

cc) Stipules prolonged, more or less acute (fig. 13 a, b); pods sessile within the calyx; spike usually 2-flowered . . . . . *O. nigrescens*

bb) Stipules membranaceous with less conspicuous veins, densely silk-hairy on the outside (not glabrescent in age), grown together forming a tube around the stem; bracts membranaceous; spike 1—5-flowered.

d) Stipules very thin, broad, rounded; pods long-stipitated within the calyx; the ovary usually, even in early stage, shortly black-hairy . . . . . *O. longipes*

dd) Stipules slightly more firm, prolonged, acute (fig. 11 f); pods practically sessile within the calyx, shortly and evenly white-hairy . . . . . *O. kamtschatica*

aa) Spike more than 5-flowered, bracts green, usually reaching to the base of the calyx-teeth or further

e) Calyxlobes glandular . . . . . *O. leucantha*

ee) Calyxlobes not glandular

f) Flowers blue, rarely white, standard rounded at the apex.

g) Spike elongated, at least in age, usually with more or less remote flowers; bracts usually longer than the calyx; stipules one-nerved, slightly reticulated, the upper long-acuminated (fig. 12 d, e) . *O. erecta*

gg) Spike short, contracted; bracts not reaching as far as the apex of the calyx-teeth; stipules one or many-nerved.

h) Caudex long, covered with reddish-brown, practically one-nerved, triangular or narrowly triangular stipules (fig. 14 a, b); spike usually about 6-flowered . . . . . *O. rubricaudex*

hh) Caudex short with hyaline many-nerved or reticulated, broadly ovate, often long-acuminated stipules (fig. 14 c, d); spike more than 6-flowered *O. litoralis*

ff) Flowers yellow, standard clearly emarginate *O. Maydelliana*

536. ***Oxytropis erecta*** Komarov in Fedde, Rep. Spec. Nov. XIII (1914) p. 228.

Oxytropis Protopopovi Komarov in Fedde, Rep. Spec. Nov. XIII (1914) p. 226.

South Kamtchatka: Savoiko Komarov 1909; Hutor June 26th 1928 W. Eyerdam.

East Kamtchatka: Lake Ovalni near Korjatskaja volcano Komarov 1908; between Petropavlovsk and Avatcha volcano 350 m. Aug. 6th 1920 Hn No. 770 a and b; Avatcha volcano 900 m. July 30th 1920 Hn No. 572; Lake Kronoki Komarov 1909 (Hb. Holm.); Klutchevskaja volcano Afanasejev 1909, do. Kozlovsky 1909, do. E. slope July 23rd 1927 P. T. Novograblenof.

Central Kamtchatka: Ganala Komarov 1909, Vaktal R., Ganala Protopopof 1908 (sub *O. Protopopovi*); Bolshaja Tolbatchik volcano in *Larix* wood July 27th 1927 P. T. Novograblenof (f. fl. albis).

Our species closely resembles large specimens of *O. argentata* (Pall.) Bunge, which, however, has distinctly one-nerved and more glabrescent stipules, while our plant has reticulated stipules, although they may be said to be one-nerved (fig. 12 d, e). I have seen only some few specimens of *O. argentata* and have no idea of the variation of that species. Our plant is very variable. It sometimes has practically no stem, but sometimes the caudices grow out into long horizontal stems (Hn No. 770 b). Hn No. 770 a shows a transition form between these two extremes. The spikes are sometimes comparatively compact, at any rate in the flowering stage, but usually more or less lax at the base, or occasionally even along its whole length (the specimen from Bolshaja Tolbatchik and that from Klutchevskaja collected by Malaise). The leaves are sometimes verticillate. Hn No. 570 has not verticillate leaves, but from seeds taken from that herbarium-specimen plants with verticillate leaves have grown up in Hortus Bergianus. This characteristic cannot therefore be used in the taxonomy of the group. Komarov described a plant under the name *O. Protopopovi* which differs from his *O. erecta* in having long creeping caudices, verticillate leaves and remote flowers at the base of the spike. As these characteristics are not always combined, but occur separately in different degrees in the material of the group, I cannot consider the type to be a separate species. However, more material will be needed to clear up all the puzzling forms of this group, which may be caused by hybridization between two species. *O. erecta* is illustrated in Pl. II fig. a.

Type of distribution: ?

Geographical area: So far only known from our area.

537. ***Oxytropis kamtschatica*** spec. nov. tab. II fig. c, d.

Subcaulescens, procumbens, sericeo-cana, caudice rachidibus stipulisque prioris anni tecto, stipulis membranaceis, hyalinis, plurinerviis, late lanceolatis, intus glabris, extus sericeis, ad dimidiam partem longitudinis suae vel longius inter se connatis, itaque tubula caulem cingentibus; foliis 10—14-jugis, bracteis membranaceis, acutatis, tubulae calycis longitudinem fere aequantibus; capitulis

1—6-floris, normaliter 4-floris; floribus violaceo-coeruleis raro albis; calyce albo—fusco-piloso, dentibus longitudinem dimidiam tubi aequantibus; legumine subcylindraceo, utrinque acutato, 3—3,5 cm. longo, circ. 6 mm. lato, in calyce sessili vel brevissime pedunculato, breviter et regulariter albo-piloso, semina 20—30 continente, sulcato, semibiloculari.

Affinis *O. longipedi* Fisch.; differt legumine sessili, stipulis tenuioribus et foliolis magis numerosis.

East Kamtchatka: Avatcha volcano 900 m. July 30th 1920 Hn No. 570 a (type specimen) and 570 b (f. flor. albis); do. S. W. slope of mt. Sarai Perfiljef 1911; Korjatskaja volcano Aug. 14th 1928 W. Eyerdam; Klutchevskaja volcano Aug. 6th 1927 Malaise No. 144 b.



Fig. 11. a Pod of *Oxytropis longipes;* b, c opened pod of *Oxytropis kamtschatica,* d ripe pod, e section of pod, f stipules of *Oxytropis kamtschatica.* (a—d natural size, e, f double natural size).

All the collects enumerated above are in flower and at the same time have practically ripe pods. Of Hn No. 570 a a large amount of material was gathered and the plant is apparently common on the Avatcha volcano.

It is difficult to decide to which of Bunge's sections our plant belongs. It is certainly very closely related to *O. longipes* Fisch., which species however, acc. to Bunge, belongs to section 11. *Caeciabia,* characterized by long-stipitated pods. As our plant actually differs from *O. longipes* in having sessile pods, it cannot come under the section *Caeciabia* but must be put in section 10. *Arctobia,* together with *O. nigrescens.* It seems probable that the section *Caeciabia* of Bunge is not natural, the long stipe of the pods apparently being of less systematical importance, as *O. revoluta* and *O. longipes,* belonging to the section *Caeciabia,* appear to be very closely related to *O. nigrescens* and *O. kamtschatica* respectively, which must be placed under the section *Arctobia.* (Compare the key to the species above.)

Unfortunately the material of *O. kamtschatica* that is at present available is too small to allow of any judgement being formed as to its range of variation, and it is therefore very difficult to distinguish between the two species

O. longipes and *O. kamtschatica* when pods are not present, When in fruit they are very different, *O. longipes* having short and more fusiform pods, long-stipitated within the calyx (fig. 11 a), while *O. kamtschatica* has longer and more cylindrical pods, sessile or very short-stipitated within the calyx (fig. 11 b—e). When they are ripe they open and lie like flat elliptical membranaceous discs on the ground. To judge from the material now available, however, our species has slightly firmer, more prolonged and acute stipules (fig. 11 f), somewhat more numerous pairs of leaflets (in *O. longipes* 6—10) and somewhat smaller flowers. None of these characteristics, however, offer sufficient grounds for separating the plants, and they need to be still more studied in nature.

Type of distribution: ?

Geographical area: So far only known from our area.

538. ***Oxytropis leucantha*** (Pall.) Pers., Synops. plant. II (1807) p. 331.

Bunge in Mém. Ac. Imp. Sc. St. Petersb. Ser. VII T. XXII (1876) p. III. — [*Astragalus leucanthus* Pall., Spec. Astrag. p. 59].

West and North Kamtchatka: Karaginsk Island Mertens acc. to Bunge loc. cit.

I have not seen specimens of this species from our area, but the report of Bunge can hardly be doubted.

Type of distribution: Asiatic—Western American.

Geographical area: Asia: from Yenisei to Chukch Penins. southwards to Jakutsk distr., Maja R. and Karaginsk Island. America: Alaska (acc. to A. Gray).

539. ***Oxytropis litoralis*** Komarov in Fedde, Rep. Spec. Nov. XIII (1914) p. 228.

South Kamtchatka: Shore of Lake Tolmachovaja 600 m. July 12th 1922 Hn No. 3895, do. July 13th 1922 Hn No. 3932.

East Kamtchatka: between Nalutcheva and Kalashtyrka Sept. 14th 1910 Perfiljef; near the mouth of Kamenuchka R. Komarov 1909; Ustj Kamtchatka Bezais 1908, do. June 10th 1925 Malaise, do. July 6th 1926 Malaise No. 144 (f. flor. albis).

It seems very probable that this species is identical with *O. retusa* Matsum. (Bot. Mag. Tokyo XV 1901 p. 116). As however this group of *Oxytropis* is very critical it is hardly possible to identify the two species without also seeing a type or co-type specimen of *O. retusa,* and I therefore retain the name of Komarov, although it may not be the valid one. *O. litoralis* also resembles *O. ajanensis* Bunge, which however has narrower stipules and longer calyx-teeth — at least the specimens from Ajan collected by Tiling on which Bunge founded that species. To get a definite idea of this critical plant is hardly possible before good series of specimens can be studied from different parts

of the area of the species. For differences between *O. litoralis* and *O. rubricaudex* see under the latter name. *O. litoralis* is illustrated in Pl. II fig. b.

Type of distribution: ?

Geographical area: So far only known from our area. The probably identical species *O. retusa* occurs in the northern and southern Kuriles.

540. ***Oxytropis longipes*** Fisch. ex Bunge in Mém. Ac. Imp. Sc. St. Petersb. Ser. VII T. XXII (1876) p. 118.

Kom., Voy. Kamtch. p. 456.

South Kamtchatka: Opala volcano 1040 m. July 21st 1921 Hn No. 2324; Lake Natchika Ramenski 1908; Savoiko Ramenski 1908.

East Kamtchatka: Avatchinskaja volcano Ditmar; Klutchevskaja volcano 3600 feet Bezais 1908 (Hb. Holm.), do. Afanasejev 1909, do. N. E. slope 1100 m. July 22nd 1927 P. T. Novograblenof.

Central Kamtchatka: Mt. Aak Komarov 1908 (f. *albiflora*), Gremushej R. Komarov 1908; the Ganala »tundra» Komarov 1909 (Hb. Holm.); Ganala Dybovsky 1879; Kamtchatka vershina Komarov 1909, do. Grinop 1909; Anauna R. Sept. 5th 1926 Malaise No. 142; upper (Kosyrevsk-) Bystraja R. April 5th 1925 Malaise No. 482.

West and North Kamtchatka: Tigil Levitzky (in Hb. Hort. Petrop., not original label).

»Kamtchatka»: Collector unknown »Kamtchatka *Oxytropis longipes* Fisch. Gab mir F. E. L. Fischer als solche im J. 1847 Meinshausen», Stewart, Petropavlovsk Mertens acc. to Bunge loc. cit. (the place is certainly not correct), Peters, Rieder.

This plant is very closely related to *O. kamtschatica*. Several but not all of these specimens have developed pods. The other are placed in this group because of their stipitated ovary.

Type of distribution: Eastern Asiatic.

Geographical area: Known from Vilju, Verkojansk and Olekminsk districts (acc. to Kom. 1926), from Ochotsk distr. (Ola, Bjeloussov!), Gishiginsk distr. and Kamtchatka Penins.

541. ***Oxytropis Maydelliana*** Trautv. in Acta Horti Petrop. VI (1879) p. 16.

South Kamtchatka: Opala volcano 1040 m. July 23rd 1921 Hn No. 2326.

East Kamtchatka: Avatcha volcano 900 m. July 30th 1920 Hn No. 587 (without flowers or fruits but probably belonging to this species); Cape Shipunski Ditmar June 1852 (sub *O. sordida?* det. Maxim); Cape Kozlov June 20th—30th 1923 Malaise; »east coast of Kamtchatka» Rieder 1831.

Central Kamtchatka: Malka Komarov 1909; Ganala Dybovsky; Kamtchatka vershina Komarov 1909.

West and North Kamtchatka: Karaginsk Island Postels, Mertens.

O. Maydelliana, as already pointed out by Ostenfeld (Gjöa Exp. p. 20), is synonymous with *O. campestris* var. *melanocephala* Hook. Compare Fernald in Rhodora 30 (1928) p. 142.

It differs distinctly from *O. campestris* in its stipules, which become castanous in age. The stipules vary considerably from practically one-nerved to reticulated (comp. fig. 12 a—c) but they are always more long-acuminated than in any other species in Kamtchatka. They are glandular in the margin, especially towards the apex. The calyx teeth are comparatively short and usually densely black-hairy. Compare also under *O. rubricaudex*.

Type of distribution: American, transgressing into Eastern Asia.

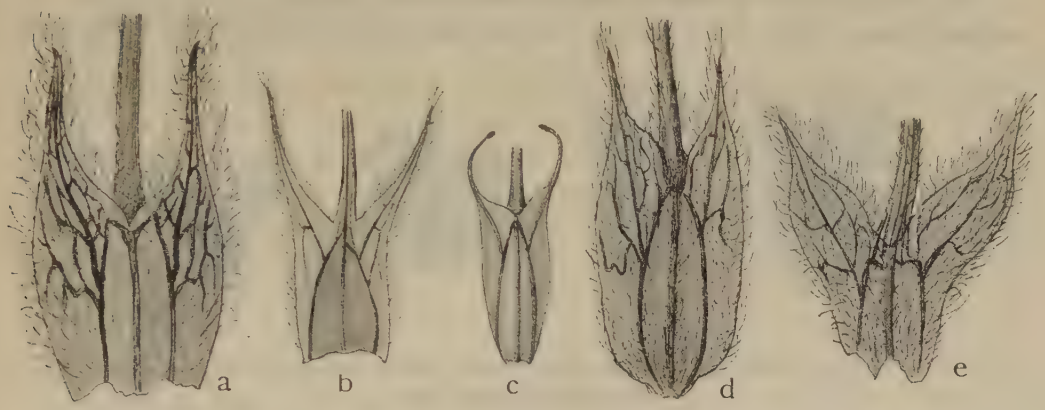


Fig. 12. a, b, c Stipules of *Oxytropis Maydelliana* (a the specimen from Cape Koslof, b and c Hn No. 2326); d, e stipules of *Oxytropis erecta*. (All double natural size).

Geographical area: Asia: known from Gishiginsk distr., Chukch Penins. and Kamtchatka. America: Cape Nome, N. coast of Alaska, the Arctic American Archipelago and arctic mainland eastwards to Hudson Strait (acc. to Fernald loc. cit.).

542. ***Oxytropis nigrescens*** (Pall.) Fisch. in DC., Prodr. II (1825) p. 278.

Bunge in Mém. Ac. Imp. Sc. St. Petersb. Sér. VII T. XXII (1876) p. 113. — [*Astragalus nigrescens* Pall., Spec. Astrag. (1800) p. 65 tab. 53.]. — *Oxytropis japonica* Matsum., Enum. Pl. Jap. II p. 272. — *?Oxytropis pumilio* (Pall.) Ledeb., Kudo, Fl. Paramush. p. 126.

Northern Kuriles:? Paramushir Kudo 1920; Shumshu acc. to Matsum. loc. cit.

South Kamtchatka: Cape Lopatka E. coast June 17th 1920 Hn No. 21, do. June 22nd 1920 Hn No. 93, do. W. coast June 24th 1920 Hn No. 144 and 144 a (f. fl. albis); Mt. Taburett (Natchika) Rubinski 1909 (Hb. Acad. Petrop. sub *O. revoluta*).

East Kamtchatka: Avatcha volcano 900 m. July 30th 1920 Hn No. 570 c; Mt. Krasheninnikof Komarov 1909; Klutchevskaja volcano Bezais 1908, do. N. E. slope Afanasejev 1908, do. the central »doll» 1600 m. July 23rd 1927 P. T. Novograblenof.

Central Kamtchatka: Mt. Zerkalo, Malka July 27th 1928 P. T. Novograblenof (var. *japonica*); Ganala Kegel; Anauna R. Aug. 18th 1926 Malaise No. 141, do. Sept. 6th 1926 Malaise No. 140; Ushki Protopopof 1909.

West and North Kamtchatka: Pallan June 27th 1927 Longinoff (Hb. Holm.); Karaginsk Island Mertens.

»Kamtchatka»: Merk. (Hb. Fisch.).

O. nigrescens is a fairly variable plant, which occurs within our area in several forms. The black colour of the hairs on the calyx from which the

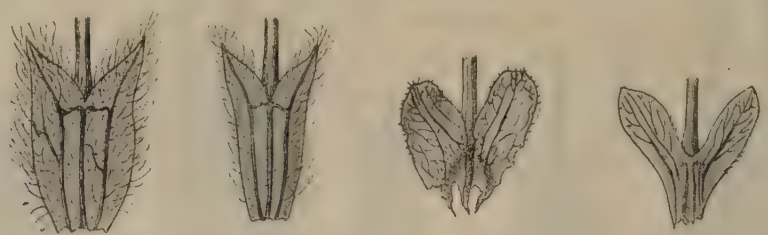


Fig. 13. a, b Stipules of *Oxytropis nigrescens* (Hn No. 93); c, d stipules of *Oxytropis revoluta*. (All double natural size).

species got its name is not constant, forms with white hairs occurring as well. The stipules (fig. 13 a, b) sometimes have long free tips and sometimes shorter, more deltoid and obtuse (for instance the specimen from Cape Lopatka), all transition-forms beeing represented. The flowers are blue, reddish-blue or white. The hairiness of the plant also varies a good deal; it is usually dense white silk-hairy, but forms with sparse hairiness also occur. The plant from Mt. Zerkalo, Malka, collected by Novograblenof, closely agrees with the two specimens of *O. japonica* Maxim. that I have seen from Japan. I can not however find that they are but a narrow-leaved, sparsely hairy variety of *O. nigrescens*. The pods are sessile within the calyx as well on the Kamtchatka specimen as on those from Japan, and not »breviter inclusostipitato», as stated by Maximovicz in the original diagnosis (Mél. Biol. XII 1886 p. 436). A slight variation in this characteristic is however found in other *Oxytropis* species, and it is apparently not of fundamental importance. Thus, our species — which has sessile pods — is certainly most closely related to *O. revoluta*, which has long-stipitated pods, as it closely agrees with that species in the structure of the organs, which is of as much importance in the taxonomy of this group as the stipules and bracts.

The species illustrated by Pallas in Spec. Astrag. tab. LV under the name of *Astragalus pumilio* and described from specimens collected in the Kuriles

is most probably this species, as the picture agrees closely with a form of our plant occurring in South Kamtchatka. The plant starts flowering as early as in the beginning of June.

Type of distribution: Eastern Asiatic.

Geographical area: Asia: from the mouth of Yenisei eastwards to Chukch Penins., southwards to Vilju distr., Jakutsk distr. and the Kuriles (var *japonica* in Japan). America: St. Lawrence Island (Chamisso! Kjellman!). The plant from northern Alaska and Melville Island which has passed as *O. nigrescens* was recently (Rhodora 30, 1928 p. 153) regarded by Fernald as a distinct species *O. pygmaea* (Pall.) Fern. In arctic America also the closely related species *O. arctobia* Bunge.

Oxytropis retusa Matsum.

Kudo, Fl. Paramush. p. 127.

To judge from the diagnosis by Matsumura, this plant is the one here named *O. litoralis*. If this is correct the name of that plant should be *O. retusa*. Kudo, however, reports his plant as collected »In pratis subalpinis» and it may therefore equally well be *O. erecta* or *O. rubricaulis*. When I saw the specimens of Kudo I did not know that my group No. 3 (see above) had to be divided into three species and therefore did not critically study them. Compare under *O. litoralis*.

543. ***Oxytropis revoluta*** Lebeb., Fl. Ross. I (1842) p. 588.

Bunge in Mém. Ac. Imp. Sc. St. Petersb. Sér. VII, XXII (1876) p. 116; Kom., Voy. Kamtch. p. 344.

South Kamtchatka: Cape Lopatka E. coast June 22nd 1920 Hn No. 94, do. W. coast June 24th 1920 Hn No. 132; Kambolnaja at the sea-shore Bezais 1909; N. of Javina village noted by Hn; between Javina and Kochegochek Rubinski 1909; Shadutka volcano 1125 m. Aug. 2nd 1921 Hn No. 2576; near Shadutka volcano noted in A. 82; Assatcha mts. 1125 m. noted by Hn; Akhomten Bay 250 m. Sept. 11th 1920 Hn No. 1317, do. in the delta of the river noted by Hn, do. noted in A. 36 a, A. 36 b, A. 37 b; Mutnovskaja volcano 1460 m. noted by Hn; Gorelaja volcano 900 m. noted in A. 170, A. 171; Opala volcano 1100 m. July 21st 1921 Hn. No. 2299; do. 1300 m. noted by Hn; Lake Tolmachovaja noted by Hn; (Paratunka-) Karymchina R. on islands in the river Komarov 1908; mt. Babi Kamen (Paratunka valley) Komarov 1908; mt. Trubi (Vilju R.) Komarov 1908 (Hb. Berol.); Shalsan Vossnesensky 1848.

East Kamtchatka: Avatcha volcano 900 m. July 30th 1920 Hn No. 627; Kishpinitch volcano Komarov 1909; Uzon Komarov 1909; the Kronoki Pass Komarov 1909; Klutchevskaja volcano 3600 feet Bezais (Hb. Berol.), do. Kozlovski 1909, do. Afanasejev 1909 (sub »*Oxytropis longipes* f. flore albo» Hb. Acad. Petrop.), do. Aug. 6th 1927 Malaise; Ustj-Kamtchatka July 14th 1927 Malaise.

Central Kamtchatka: Mt. Aak KOMAROV 1909; Ganalski Vystraki KEGEL, do. STEWART; upper Kashkan R. KOMAROV 1909; Kunchekla PROTOPOPOF 1909.

West and North Kamtchatka: Tigil LEVITZKY; between Sedanka and Jelovka BEZAIS 1909; Karaginsk Island MERTENS, do. LOGINOVSKI 1910.

»Kamtchatka»: KEGEL, STEWART, PETERS, RIEDER, »LAZAREW TSCHERNICH and FIRS 1831», DYBOVSKY 1879.

Noted in the following associations:

In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Abundant (A. 37 b).
In *Artemisia arctica—Rhododendron kamtschaticum—Salix »arctica»* ass.:
Single (A. 171); Abundant (A. 36 a, A. 36 b).
In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 82).
In *Vaccinium—Diapensia*—Lichen ass.:
Single (A. 170).

In the alpine region of South Kamtchatka *O. revoluta* is fairly common in the heaths and dry meadows, occurring practically up to the limit of vegetation.

It is perhaps the most characteristic of the *Oxytropis* species in the country and is easily recognized in its natural state by its long-stipitated pods, dark-blue flowers (forms with white flowers occur), rounded stipules (fig. 13 c, d), long persistent rachis of the leaves of the previous year, glabrescent stems, and leaves, which are dark-green with few pairs of pinnae. The margins of the pinnae are rolled back — a fact that caused LEDEBOUR to give our plant the name of *revoluta*.

It flowers from the middle of June to the end of July.

Some of the specimens are practically glabrous (HN No. 94 and part of HN No. 132).

Type of distribution: Endemic.

Geographical area: So far only known from our area.

544. ***Oxytropis rubricaudex*** nov. sp. Tab. II fig. e, f.

Subcaulescens, caudicibus circ. 5 cm. longis, stipulis ferrugineis petiolisque saepe resistantibus tectis, stipulis quoad partem liberam subuninerviis, triangularibus vel rhomboidalibus, acutiusculis, circ. 5 mm. longis et 3—5 mm. latis, margine glanduloso, pilis longis sparsis in margine et extus praeditis, superioribus membranaceis rubrinerviis, inferioribus strictis, ferrugineis glabrescentibus; foliis 8—10-jugis; scapi circ. 10 cm. longi foliis longiores; capitulis circ. 6-floris, bracteis viridibus, late lanceolatis vel ovatis, longitudinem calycis aequantibus, dentibus calycis tubo paulo brevioribus, dorsalibus duobus quam ceteris brevioribus; petalis coeruleis, vexillo ellipsoideo, saepe emarginato, carina

mucrone circ. 1 mm. longo, sat abrupte posito, legumine circ. 15 mm. longo, 7 mm. lato, in calyce sessili, erecto, pilis albis vel fuscis vestito.

Affinis *O. litorali* KOM. et *O. retusae* MATSUM.; differt caudicibus longis stipulis angustioribus ferrugineis, subuninerviis persistentibus, capitulo pauciflore, indumento minus denso.

South Kamtchatka: Cape Lopatka June 17th 1920 HN No. 22, do. June 22nd 1920 HN No. 95 a and 95 b; mt. Krasni gor, Lake Natchika Aug. 10th 1908 KOMAROV (sub *O. revoluta*).

East Kamtchatka: Chartchina mts. Aug. 12th 1927 MALAISE.

Central Kamtchatka: Mt. Aak KOMAROV 1908.

The stipules of *O. rubricaudex* (fig. 14 a, b) are more firm and persistent than those of *O. litoralis* (fig. 14 c, lower and d, upper). The caudex of the



Fig. 14. a, b Stipules of *Oxytropis rubricaudex* (HN No. 22); c, d stipulis of *Oxytropis litoralis* (c MALAISE No. 483, d the specimen of PERFILJEF from Nalutcheva—Kalashtyrka). (All double natural size).

former species is therefore covered by the old, dark reddish-brown stipules while the much shorter caudex of the latter usually only bears remains of the much more membranous stipules of that species. When the colour of the flowers is not clear our plant sometimes resembles *O. Maydelliana*, from which it differs in rounded or not so clearly emarginate standards and (sometimes only slightly) shorter points of the stipules which otherwise can be somewhat similar. I consider HN No. 95 a as the type specimen. It is figured in Pl. II fig. e, f.

Our plant can hardly be *O. retusa* MATSUM. as that species is described as »acaulis . . . stipulae . . . ovatae acutae sericeae . . . flores purpurei? multiflori, congesti.» — all characteristics that agree with *O. litoralis* KOM. and not with this species. It is nevertheless probable that our plant occurs also in the northern Kuriles, and may in that case be included in the material from there reported as *O. retusa*.

Type of distribution: ?

Geographical area: So far only known from our area.

545. ***Hedysarum obscurum*** L., Syst. Nat. ed. X (1759) p. 1171.[1]

BASINER, Monogr. gen. *Hedys.* p. 13; FEDTSCH. Obz. vid. *Hedysarum* p. 231 (var. *genuinum*, var. *kurilense*); KUDO, Fl. Paramush. p. 127 (var. *neglectum*). — *Hedysarum* MERTENS, Bemerk. Fl. Koragins p. 62.

Northern Kuriles: Paramushir KODAMA 1893, KUDO 1920.

South Kamtchatka: Gorelaja volcano 700 m. July 14th 1922 HN No. 3937, do. 800 m. July 30th 1922 HN No. 4063.

East Kamtchatka: Near Petropavlovsk BOGDANOVITSCH 1898; between Petropavlovsk and Avatcha volcano 350 m. Aug. 6th 1920 HN No. 758; Lake Ovalni, Sheljeznoi R. KOMAROV 1908; Lake Kronoki KOMAROV 1909; Cape Kozlov June 10th 1923 MALAISE; the foot of Klutchevskaja volcano RIEDER; Klutchevskaja volcano 3600 feet BEZAIS (Hb. Berol.); Ploskaja volcano PROTOPOPOF 1908; Ustj Kamtchatka July 15th 1925 MALAISE No. 485.

Central Kamtchatka: The Ganala »tundra» PROTOPOPOF 1908; do. KOMAROV 1909; upper Kashkan R. KOMAROV 1909; Klutchi AFANASEJEV 1909.

West and North Kamtchatka: Between Sedanka and Jelovka BEZAIS 1909; Tigil LEVITSKY 1848; Pallan SAVTCHENKO 1911, do. June 27th 1927 LONGINOFF (Hb. Holm); Karaginsk Island MERTENS, do. LOGINOVSKI 1910.

»Kamtchatka»: CHORIS; RIEDER »*H. inundatum* TURCZ.».

In South Kamtchatka this plant was seen only within a small area on Gorelaja volcano, where, however, it is common. Most of the specimens are in close agreement with the arctic and European form of *H. obscurum*, but some of them differ considerably from that type. This is especially the case with HN No. 758, of which a comparatively large amount of material was collected and which differs from typical *H. obscurum* in having higher, erect growth, the tubes of the lower stipules longer, often longer spike with distinctly pendulous flower, small flowers with large keel, more distinct veins on the calyx and flowers less deep in colour. Also some of the other specimens (both the specimens of RIEDER, that of LEVITZKY and possibly that of BEZAIS from Sedanka—Jelovka) more or less clearly differ in these characteristics from the typical form. Such plants were by TURCZANNINOV referred so his *H. inundatum* (in Bull. Mosc. XV 1842 p. 781).

Although the living plant, when I collected it on a small open place crossed by the path to Avatcha volcano, gave an impression quite different from that of *H. obscurum* I cannot find definite lines of demarcation against that species and therefore preliminarily take it as a variety, var. *inundatum* (TURCZ.) nov. comb., of *H. obscurum*. It resembles a type specimen of *H. auriculatum* EASTW., which I have seen, and may on further investigation prove to be a distinct type.

[1] An older name is *Astragalus Hedysaroides* L. (Sp. pl. ed. I, 1753 p. 756). The name *Hedysarum Hedysaroides* (L.) SCHINZ & THELL., however, is inconsistent and therefore not used. Compare HULTÉN, Fl. Kamtch. II p. 173.

It was probably such specimens that caused FEDTSCHENKO (loc. cit. p. 243) to say that the specimens of MERTENS from Petropavlovsk should rather be referred to *H. alpinum*.

Type of distribution: Eurasiatic.

Geographical area: Europe: From eastern Kola penins. and Nova Zembla southwards to northern Perm prov., also in the high mts. of central Europe southwards to Spain, the Alps, northern Balkans and Caucasus. Asia: along the North Coast eastwards to Chukch Penins., southwards in the high mts. to Asia Minor, Afghanistan and Kashmir (acc. to FEDTSCH. loc. cit.), Alatau, Altai, Transbaikalia, Ussuri, Saghalin and Yezo.

Hedysarum Mackenzii RICHARDS.

In Hb. Hort. Petrop. there are preserved two specimens of this species, acc. to the labels from Kamtchatka. The first was collected by MERK »ex Hb. PALLASII» (at first named »*Merkianum* m.»), the second by POSTELS, both on Karaginsk Island. This species, which occurs in northern E. Asia and W. America, might well be expected in the northern part of our area, though I think that its occurrence there needs confirmation.

Vicia amoena FISCH.

MIYABE, Fl. Kuril. p. 225.

The report of this species from Kamtchatka is certainly not correct.

546. ***Vicia Cracca*** L., Sp. pl. ed. I (1753) p. 735.

CHAMISSO in Linnaea VI (1831) p. 547; LEDEB., Fl. Ross. I p. 674.

South Kamtchatka: 20 km. S. of Bolsheredsk Aug. 18th 1921 HN No. 2895; half way between Bolsheredsk and Apatcha RIEDER 1833, do. KOMAROV 1908, do. RUBINSKI 1909, do. noted in A. 113.

»Kamtchatka»: KUSMISCHEFF, LIBOSCHITZ (Hb. FISCHER), »Petropavlovsk MERTENS» (the place is certainly not correct); RIEDER (Hb. Berol.).

CHAMISSO's report of this species from Kamtchatka, repeated by LEDEBOUR, was based on specimens collected by REDOWSKY who, however, never visited our area.

Noted in the following association:

In *Angelica ursina—Filipendula—Thalictrum* ass.:

Single (A. 113).

V. Cracca was only observed in the two above-mentioned localities situated close to one another. They were flowering. It seems somewhat doubtful whether the species is indigenous within our area.

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland, northernmost Scandinavia and northern Russia southwards. Asia: throughout the forest- and steppe- belts

of Siberia to Jakutsk prov. and Kamtchatka, southwards to Turkestan, Szech'uan, Hupeh, Corea and Honshu. America: naturalized from Europe throughout N. Amer., from British Columbia to Newfoundland southwards to Idaho and Kentucky, S. Greenland. Also in N. Africa.

Lathyrus altaicus LEDEB.

»*Lathyrus pedunculis paucifloris, floribus laxis, stipulis magnis* . . .» GMEL., Fl. Sib. IV p. 8. — »*Lathyrus* Gm. Sib. IV 85» PENNANT, Arct. Zool. (1784) p. CXVI.

The above report of GMELIN's was identified by LEDEBOUR (Denkschr. Bot. Ges. Regensb. 1841 p. 110) as *L. altaicus*, a plant that does not occur in Kamtchatka.

547. ***Lathyrus maritimus*** (L.) BIGELOW, Fl. Bost. ed. II (1824) p. 268.

YABE & YENDO, Fl. Shimushu p. (186); KOM., Voy. Kamtch. pp. 118, 349, 453; KUDO, Fl. Paramush. p. 127. — [*Pisum maritimum* L., Sp. pl. ed. I (1753) p. 727]; CHAMISSO in Linnaea VI (1831) p. 547; LEDEB., Fl. Ross. I p. 661; KITTLITZ, Denkw. II pp. 277, 400; DITMAR, Reisen I pp. 130, 287, 289, 300 et II p. 92; FEDTSCH., Fl. Îl. Comm. p. 49; PALIBIN in Acta Hort. Jurjev. 9 (1908) p. 93. — *Lathyrus pisiformis* L., HOOK. & ARNOTT in Beechy's Voy. p. 113.

Northern Kuriles: Paramushir C. TARO 1892, KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: S. of Kambolnaja BEZAIS 1909; shore of Kurile Lake Aug. 27th 1922 HN No. 4403, do. near the estuary of the river Aug. 28th 1922 HN No. 4448; N. of Ozernaja village noted by HN; the mouth of Opala R. noted by HN; N. of Opala village noted by HN; Akhomten Bay noted in A. 24 b; the mouth of Bolshaja R. RUBINSKI 1909, do. noted in A. 44 a, A. 44 b; »Paratun» July 27th 1849 STUBENDORFF.

East Kamtchatka: The entrance of Avatcha Bay PERFILJEV 1911; Petropavlovsk MERTENS, do. VOSSNESENSKY 1848, do. WRIGHT 1853—56, do. BOGDANOVITSCH 1898, do. KOMAROV 1908, do. PROTOPOPOF 1908, do. RUBINSKI 1908, do. SAVITCH 1908, do. PERFILJEV 1910, do. July 21st 1920 HN No. 530, do. Aug. 17th 1920 HN No. 929, do. June 1st 1921 HN No. 1606; between Kalashtyrka and Nalutcheva PERFILJEV 1911; N. of the mouth of Shupanova R. acc. to DITMAR loc. cit. p. 287; near the mouth of Tishaja R. KOMAROV 1909; S. of the mouth of Berjozovaja R. acc. to DITMAR loc. cit. p. 289; near the mouth of Krodakyg R. acc. to DITMAR loc. cit. p. 306; Ustj Kamtchatsk KURTASHOF 1909, do. PROTOPOPOF 1909, do. July 15th 1925 MALAISE No. 484; »Ad margines fl. Kamtschatka 30 Aug. 1846 VOSSNESENSKY».

Commander Islands: Bering Island KJELLMAN, DYBOVSKY, DOBROTVORSKY, GREBNITZKY and acc. to FEDTSCH. loc. cit. STEJNEGER; Copper Island DYBOVSKY 1879 and acc. to FEDTSCH. loc. cit. DOBROTVORSKY and MOROZEVICZ.

West and North Kamtchatka: Kompakovaja ZELENIN 1908; the mouth of Krutugorovaja R. RUBINSKI 1908; Tigil LEVITZKY 1848, do. BOGDANOVITSCH, do. BEZAIS 1909, do. GUDZENKO 1910; Karaginsk Island MERTENS, do. POSTELS, do. LOGINOVSKI, do. GUDZENKO 1910.

»Kamtchatka»: Langsdorff, Eschscholtz, Stewart, Kastalsky, Mertens, »Exp. Lütke», Peters 1831, Rieder.

Noted in the following association:

In *Elymus* ass.:

Single (A. 44 a, A. 44 b); Sparse (A. 24 b).

This species is comparatively common on sandy beaches along the coast of South Kamtchatka. It was also found on the shores of Kurile Lake. It flowers from the middle of June to the end of August. The hairiness of the species varies a good deal, here as well as in other parts of its area (in Scandinavia as well as in America). On the whole, more northern specimens are more hairy, although this is not always the case. Most of our specimens should be referred to f. *velutinus* Fr.

Type of distribution: ? Circumpolar.

Geographical area: Seashores. Europe: from Iceland, northernmost Scandinavia and Kola Penins. southwards to the British Isles, France and the southern Baltic Sea (distribution not always confluent). Asia: known from Verchojansk distr. and from Ochotsk and northern Kamtchatka southwards to northern China and southern Japan. America: known from near the mouth of Mackenzie R. (69° N. lat.) and from Kotzebue Sound southwards to California (41° N. lat.) and from Labrador (58° N. lat.) to New Jersey (39° N. lat.), also around the Great Lakes. Southernmost Greenland.

548. ***Lathyrus palustris*** L., Sp. pl. ed. I (1753) p. 733.

var. ***pilosus*** (Cham.) Ledeb., Fl. Ross. I p. 686.

Maxim. in Mél. Biol. IX: 1 (1873) p. 61; Fedtsch., Fl. Îl. Comm. p. 50; Fernald in Rhodora 13 (1911) p. 51. — *Lathyrus pilosus* Chamisso in Linnaea VI (1831) p. 548. — *Lathyrus palustris* Hook. & Arnott in Beechy's Voy. p. 113; Kom., Voy. Kamtch. p. 455; Kudo, Fl. Paramush. p. 128. — *Lathyrus palustris* var. *linearifolius* Yabe & Yendo, Fl. Shimushu p. (186).

Northern Kuriles: Paramushir Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Javina village (one single specimen) noted by Hn; between Kochegochek and Golygina on the sea-shore Aug. 14th 1921 Hn No. 2877; Opala R. 30 verst from the mouth Rubinski 1909; Lake Kambolnoj Sept. 15th 1922 Hn No. 4593; the mouth of Stegnova R. noted in A. 219; lower Bolshaja R. noted in A. 107; S. E. of Bolsheredsk at Bolshaja R. noted in A. 56; 10 km. W. of Bolsheredsk Aug. 23rd 1921 Hn No. 2920; Bolsheredsk July 10th 1921 Hn No. 2100; between Bolsheredsk and Apatcha Rubinski 1909; Apatcha village noted in meadow by Hn; Paratunka village Komarov 1908; Bogatyrjovka Perfiljev 1910, do. July 16th 1920 Hn No. 470; Mt. Kishtchik (Paratunka) Komarov 1908; Nikolajevsk Komarov 1908; Savoiko Komarov 1908, do. July 7th 1920 Hn No. 295; Korjaka village Komarov 1908.

East Kamtchatka: Petropavlovsk Chamisso acc. to Cham. loc. cit., do. Aug. 18th 1920 Hn No. 964; between Petropavlovsk and Savoiko July 5th 1920 Hn No. 221; between Petropavlovsk and Avatcha volcano 350 m. Aug. 22nd 1920 Hn No. 1023 (A. 7, A. 9, A. 17, A. 18, A. 23, A. 42, A. 43); Lake Kronoki Komarov 1909; Ustj-Kamtchatsk July 15th 1925 Malaise No. 486 and 487.

Commander Islands: Bering Island Grebnitzky 1894 and acc. to Fedtsch. loc. cit. Stejneger.

Central Kamtchatka: The Natchika Pass Komarov 1908; Lake Ovalni Komarov 1908; The Ganala »tundra» Komarov 1909; Sabatchi R., Ganala Komarov 1909; Kirganik Komarov 1909; Shtchapina Komarov 1909; Tolbatchik July 14th 1921 Hn No. 3430 (Malaise); Klutchi Bezais 1908.

West and North Kamtchatka: Tigil Levitzky 1848, do. Bezais 1909; between Tigil and Sedanka Bezais 1909.

»Kamtchatka»: Lubarsky, Stewart, Kastalsky, Kusmischeff, Mertens, Peters 1831, Rieder (sub *Vicia amoena*), Dybovsky 1879.

Noted in the following associations:
In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 7, A. 9, A. 18, A. 23, A. 42, A. 43); Sparse (A. 17).
In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 107).
In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 56).
In *Carex—Sanguisorba*—Moss ass.:
Single (A. 219).

In South Kamtchatka *L. palustris* var. *pilosus* is rare except on the northern border of the district, where it is common in the dry *Betula* forests and in the meadows. It was not observed in the valleys of the Shadutka and Ksudach rivers.

All Kamtchatka specimens of *L. palustris* are hairy on both sides of the leaves, on stems, stipules and pods. This hairy plant was described by Chamisso loc. cit., from specimens from Petropavlovsk, as *L. pilosus*. The whole Eastern Asiatic material relating to *L. palustris* belongs to this variety. West of Yenisei and Irkutsk prov., however, glabrous forms occur, and in Tobolsk prov. the hairy forms seen to be more rare. Scandinavian specimens are almost completely glabrous, except for traces of hairs in the apex of the stipules and on the petioles of the leaflets. In the material from Scandinavia that I have seen, only some few specimens from the northernmost part (Varanger fjord) had some scattered hairs along the veins of the leaflets. The hairy form occurs also in both Eastern and Western America. (Compare Fernald loc. cit.). Kamtchatka specimens are usually comparatively narrow-leaved, but to the south (in Japan and Manchuria) broad-leaved, high-grown forms of our species also occur (var. *macranthus* (T. G. White) Fern.).

Type of distribution: ?Eurasiatic, transgressing into Eastern and Western America.

Geographical area: The entire species: Europe: from the British Isles, northernmost Scandinavia and Kola Penins. southwards to the Iberian Penins., central Italy and Caucasus. Asia: from the mouth of the Yenisei, lower Lena R. and Kolyma distr. southwards to Semipalatinsk Prov., northern Mongolia, Hupeh, Chekiang, Corea and southern Japan. America: Alaska to Oregon and Manitoba, from Labrador southwards to Illinois, Tennessee and N. Carolina. Var. *pilosus* occurs in Asia at least from Tobolsk prov. and lower Yenisei eastwards, in America from Alaska to Oregon and from Labrador to Connecticut. Another hairy variety (var. *macranthus*) acc. to FERNALD also occurs as well in E. Asia as in W. and E. America, while the glabrous forms are restricted to Western Siberia, Europe and Eastern America.

Pisum sativum L.

The plant is represented in Russian herbaria by specimens collected by KOMAROV 1908 at Petropavlovsk.

Geraniaceae ST. HIL.

549. ***Geranium erianthum*** DC., Prodr. I (1824) p. 641.

HOOK. & ARNOTT in Beechy's Voy. p. 113; LEDEB., Fl. Ross. I p. 464; MAXIM. in Mél. Biol. X (1880), p. 63; YABE & YENDO, Fl. Shimushu p. (178); FEDTSCH., Fl. Îl. Comm. p. 48; KOIDZ., Pl. Yokoyam. p. 214; KNUTH in ENGLER, Pflanzenr. IV: 129 (Heft 53) p. 129; KOM., Voy. Kamtch. pp. 77, 414, 452 et Fl. Penins. Kamtsch. I p. 332; KUDO, Fl. Paramush. p. 128. — »*Geranium pedunculis bifloris foliis subpeltatis . . .*» GMEL., Fl. Sib. III p. 274 quoad pl. Kamtsch. — *Geranium pratense* PENNANT, Arct. Zool. (1784) p. CXVI; GEORGI, Beschreib. III: 5 p. 1150; MERTENS, Bemerk. Fl. Koragins p. 63; LEDEB., Fl. Ross. I p. 466. — *Geranium sylvaticum* CHAMISSO in Linnaea VI (1831) p. 544; ERMAN, Verzeichn. p. 63. — *Geranium* DITMAR, Reisen I pp. 447, 552, 687. — »a conspicous *Geranium*» BARRETT-HAMILTON, A visit to Karaginsky Isl. p. 299.

Northern Kuriles: Paramushir TARO 1892, S. YOKOYAMA 1893, KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka collected by cosacks 1909 (Hb. Hort. Petrop.), do. June 22nd 1920 HN No. 88; Kurile Lake in meadow noted by HN; N. of Kurile Lake noted in A. 208; NW. of Kurile Lake noted in A. 210, A. 211; lower Ozernaja R. noted in A. 96, A. 100; Ozernaja village noted by HN; between Javina and Kochegochek noted in A. 91, A. 92; W. of Sholtovskaja volcano noted in A. 205; S. of Kisipalok R. noted by HN; upper Unkanakchek R. noted in A. 196, A. 197; near Sahach volcano noted in A. 191; uppermost Kusingen R. noted in A. 190; middle Kusingen R. noted by HN; middle Ksudach R. noted in A 86; the junction of Golygina rivers noted in A. 89 (one metre high specimens) and A. 90; lower Golygina R. noted by HN; W. of Golygina village noted by HN; upper Ksudach R. noted in A. 83, A. 84; between the mouths of Golygina and Opala rivers noted by

Hn; Lake Sterbot noted in A 215, A. 216; the pass between Shadutka and Savan rivers noted in A. 80; upper Savan R. noted in A. 79; Topik volcano 500 m. July 27th 1921 Hn No. 2496; NW. slope of Assatcha mts. noted in A. 177; upper Opala R. near Assatcha noted in A 180, A. 182, A. 183, A. 184, A. 185; S. of Zykovaja village noted in A. 217; Akhomten Bay Aug. 30th 1920 Hn No. 1162 (Malaiše), do. Sept. 11th 1920 Hn No. 1316, do. Sept. 21st 1920 Hn No. 1437; do. noted in A. 25, A. 26, A. 31, A. 37 a, A. 37 b, A. 38; Gorelaja volcano 800 m. noted in A. 167; Mutnovskaja volcano 800 m. July 28th 1922 Hn No. 4047 and 4057; upper Udoshk R. noted in A. 78 b; Opala volcano 620 m. July 21st 1921 Hn No. 2260; do. noted in A. 71, A. 73, A. 77, A. 78 a; NW. of Opala volcano noted in A. 66, A. 67, A. 68, A. 69; upper Abshen R. in meadow and *Betula* forest noted by Hn; the mouth of Bolshaja R. noted by Hn; lower Bolshaja R. noted in A. 105, A. 106, A. 107; lower Karymchina R. noted in A. 123, A. 124, A. 151; middle Karymchina R. noted in meadow by Hn; the junction of Tolmachovaja rivers noted in A. 157; the mouth of Balaganchik R. noted in A. 152, A. 153, A. 154; near the mouth of Ipelka R. noted in A. 57, A. 60; Danilina R. noted in A. 61; Agashka R. noted in A. 62, A. 63, A. 64; the Kohelok mt. noted in A. 125; do. 660 m. in alpine meadow noted by Hn; S.E. of Bolsheredsk noted in A. 56; Bolsheredsk Rubinski 1908, do. noted by Hn; Bystraja R. near Bolsheredsk Rubinski 1908 (f. flor. albis); between Bolsheredsk and Apatcha noted in A. 113; Apatcha in meadow noted by Hn; between Apatcha and the hot springs at Siku R. noted in A. 150; the hot springs at Siku R. noted in A. 122; the upper hot spring in Paratunka valley Komarov 1908; the hot springs at Bannaja R. Rubinski 1909; lower Bannaja R. in meadow and *Angelica ursina* meadow noted by Hn; upper (Paratunka-) Bystraja R. noted in A. 128; between Paratunka and Mikisha Komarov 1908; between Paratunka and Nikolajevsk Komarov 1908; Toporkoff Island, Sarannaja Bay (= Starichkoff Island) Perfiljef 1911, do. Aug. 15th 1920 Hn No. 898; the mouth of Paratunka R. Aug. 11th 1920 Hn No. 837; Natchika Lake Komarov 1908; slope of mt Saraj., Shalsan valley Komarov 1908; Uzdets R. Komarov 1908; lower Avatcha R. acc. to Ditmar loc. cit.; between Natchika and Korjaka acc. to Ditmar loc. cit.; Mt. Zerkalo, Natchika noted in A. 114, A. 115, A. 118, A. 119, do. open spot in the *Alnus* region noted by Hn; Savoiko, Palovinaja R. Rubinski 1908; Savoiko July 7th 1920 Hn No. 268 (f. flor. albis); Avatcha Bay acc. to Hook. & Arnott loc. cit.

East Kamtchatka: Petropavlovsk Chamisso acc. to Cham. loc. cit., do. Mertens, do. acc. to Ditmar loc. cit., do. Dobrotvorsky 1881, do. Bogdanovitsch 1898, do. Yokoyama acc. to Koidz. loc. cit., do. Rubinski 1908; between Petropavlovsk and Avatcha volcano noted in A. 7, A. 9, A. 17, A. 18, A. 23, A. 42, A. 43; Mt. Saraj Avatcha volcano Perfiljef 1911; Avatcha volcano 675 m. July 31st 1920 Hn No. 642, do. Aug. 4th 1920 Hn No. 732; Kichpinitch volcano Komarov 1909, mt. Krascheninnikof Komarov 1909; N.E. slope of Klutchevskaja volcano Afanasejev 1909, do. Kurtashof 1909.

Commander Islands: Bering Island KJELLMAN, DYBOVSKY, GREBNITZKY 1894 and 1900 and acc. to FEDTSCH. loc. cit. STEJNEGER; Copper Island DYBOVSKY, DOBROTVORSKY 1881, GUDZENKO 1910 and acc. to FEDTSCH. loc. cit. GREBNITZKY, STEJNEGER, TILMAN and MOROZEVICZ.

Central Kamtchatka: Malka PROTOPOPOF 1908; the Ganala »tundra» KOMAROV 1909; Pushtchina GRINOP 1909; Mashura GRINOP 1909, do. KOMAROV 1909; Shtchapina July 22nd 1921 Hn No. 3470 (MALAISE); the upper right Shtchapina R. KOMAROV 1909; Nikkolki BEZAIS 1908; Klutchi BEZAIS 1908, do. June 26th 1921 Hn No. 3400 (MALAISE).

West and North Kamtchatka: Kol ZELENIN 1908; Tigil LEVITZKY 1848, do. acc. to DITMAR loc. cit., do. GUDZENKO; between Sedanka and Jelovka ERMAN acc. to CHAM. loc. cit.; Karaginsk Island MERTENS, do. POSTELS, do. acc. to BARRETT-HAMILTON loc. cit., do. LOGINOVSKI 1911.

»Kamtchatka»: TILESIUS, LANGSDORFF, ESCHSCHOLTZ, STEWART, KASTALSKY, KUSMISCHEFF, MERTENS, RIEDER.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 79, A. 96); Sparse (A. 83, A. 114); Scattered (A. 66, A. 84, A. 86, A. 100, A. 105, A. 107, A. 119, A. 153, A. 190); Abundant (A. 67, A. 68, A. 69, A. 91, A. 92, A. 182, A. 185, A. 191); Profuse (A. 78 b, A. 184).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 122); Sparse (A. 56, A. 61, A. 113, A. 151); Scattered (A. 124).

In *Betula platyphylla—Thalictrum—Carex* ass.:
Scattered (A. 152, A. 154, A. 157).

In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 17); Sparse (A. 106, A. 150); Scattered (A. 42, A. 43); Abundant (A. 7, A. 9, A. 18, A. 23, A. 183).

In *Betula Ermani—Filipendula—Dryopteris* ass.:
Single (A. 196); Sparse (A. 62, A. 115); Scattered (A. 64, A. 180, A. 197); Abundant (A. 63).

In *Betula Ermani—Filipendula—Equisetum hiemale* ass.:
Single (A. 57, A. 90); Scattered (A. 89).

In *Carex—Sanguisorba*—Moss ass.:
Single (A. 60); Sparse (A. 123).

In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Scattered (A. 25, A. 215, A. 216, A. 217).

In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Sparse (A. 77); Scattered (A. 78 a, A. 118, A. 125, A. 211); Abundant (A. 210).

In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 205); Sparse (A. 37 a, A. 128); Scattered (A. 26, A. 31, A 37 b, A. 71, A. 80, A. 208); Abundant (A. 73, A. 177).

In South Kamtchatka *G. erianthum* is one of the most common plants characteristic of all *Betula* forests and meadows from the seashore to the alpine region up to 900 m. (except in the *Artemisia arctica—Rhododendron kamtschaticum—Salix »arctica»* ass., to be found only in high altitudes). It flowers from the end of June to the end of September. Specimens with white flowers (f. *leucanthum* TAKEDA, Bot. Mag., Tokyo 24 p. 258) occur. *G. erianthum* is related to *G. silvaticum*, which in Eastern Asia is represented by several species forming a group: *G. erianthum* (in N.E. Siberia and W. America), *G. eriostemon* FISCH. (in S.E. Siberia, Manchuria, China and Japan), *G. Onoei* FRANCH. & SAV. and *G. Reinii* FRANCH. & SAV. (in Japan). The pedicelles of our plant are usually shorter than the calyx, at any rate at the time of anthesis, and are covered with short white hairs. However, specimens occur, as well in Manchuria and Kamtchatka as in America, with long glandular hairs mixed with the others, on the pedicelles. The hairiness of the leaves also varies considerably. Usually the underside of the leaves is quite evenly covered by short stiff hairs, but specimens with only the veins hairy also occur. The plant with glandular-hairy pedicelles, and leaves that on the underside are hairy on the veins only, were described by MAXIMOVICZ as *G. eriostemon β orientale* (Mél. Biol. X p. 629) and later by FREYN (Österr. Bot. Zeitschr. 52, 1902, p. 18) as a distinct species *G. orientale*. I have seen some of the specimens cited by MAXIMOVICZ as *G. eriostemon β orientale* and they agree well with some of the plants from Kamtchatka (for instance those from Akhomten Bay, HN No. 837, the specimens of RIEDER and LEVITZKY). As all intermediate forms are present, those forms are here included in *G. erianthum*. KNUTH in ENGLER loc. cit. also includes *G. orientale* FREYN in *G. erianthum*.

Type of distribution: Eastern Asiatic—Western American.

Geographical area: Asia: at least from Vilju distr., Gishiginsk and Chukch Penins. southwards to Amgun R., Ussuri and Honshu. America: Alaska. *G. silvaticum:* Europe and eastwards to about Yenisei. *G. eriostemon* from Vilju distr. and Yezo southwards to central China and Honshu. In Japan the closely related *G. Reinii* and *G. Onoei*.

Erodium cicutarium (L.) L'HÉR.

MAXIM. in Mél. Biol. X 1880 p. 636.

»Kamtchatka»: KUSMISCHEFF (Hb. Hort. Petrop.), RIEDER acc. to MAXIMOVICZ loc. cit.

The species certainly occurred only occasionally within our area.

Linaceae DUMORT.

Linum perenne L.

CHAMISSO in Linnaea I (1826) p. 71; LEDEB., Fl. Ross. I p. 426. — »*Linum calycibus capsulisque obtusiusculis, foliis alternis . . .*» GMEL., Fl. Sib. IV p. 115.

CHAMISSO's report was founded on specimens (now in Hb. Acad. Petrop.) collected by REDOWSKY, who, however, never visited our area. By »Kamtchatka» in GMELIN's report is probably meant »Kamtchatka province» and the plant was

probably collected at Ochotsk. *L. perenne* is not known with certainty from our area but might be expected in its northern part.

Linum usitatissimum L.

This species is represented in Russian herbaria by specimens collected at Klutchi by BEZAIS in 1909 and near the experimental farm at Petropavlovsk by KOMAROV in 1908.

Rutaceae JUSS.

Skimmia japonica THUNB.

KUDO, Fl. Paramush. p. 129.

This species is reported by KUDO as having been collected by S. YOKOYAMA in Paramushir Sept. 15th 1893. It is a Japanese species, known also from the southern Kuriles and from the southern part of Saghalin. As some other reports founded on specimens collected by S. YOKOYAMA on Paramushir are very doubtful, I think it is advisable to take this statement also with caution. It seems improbable that this plant should occur in the cold, barren Paramushir Island. The report needs confirmation.

Polygalaceae LINDL.

Polygala comosum SCHKUHR.

LEDEB., Fl. Ross. I p. 271. — *Polygala vulgaris* L. *β comosa* REGEL, Pl. Radd. Dicotyl. Polypet. No. 273, Bull. Mosc. 34: 2 (1861) p. 515 et RADDE, Reisen I: 1 p. 271.

LEDEBOUR's report of this species from Kamtchatka was founded on specimens collected by REDOWSKY (Hb. Acad. Petrop., Hb. Berol.). These specimens were not collected on Kamtchatka Peninsula as REDOWSKY never reached our area. REGEL strangely enough reports the plant as having been collected by ESCHSCHOLTZ.

The species should, until otherwise stated, be excluded from the flora of our area.

Callitrichaceae LINDL.

550. ***Callitriche autumnalis*** L., Fl. Suec. ed. II (1755) p. 2, em. WAHLENB., Fl. Lapp. (1812) p. 2.

SAMUELSSON in Veröff. Geobot. Inst. Rübel, Zürich. Heft 3, Festschr. C. SCHRÖTER p. 610.

South Kamtchatka: N. of the mouth of Opala R. Sept. 11th 1922 HN No. 4566; Lake Kambolnoje Sept. 14th 1922 HN No. 4585; the Bolsheredsk »liman» KOMAROV 1908; Lake Natchika KOMAROV 1908; Paratunka at Chaikovaja R. Oct. 12th 1923 GRÜNER.

This plant is certainly rare in Kamtchatka, where the lakes and streams are often practically without higher vegetation. In the lakes along the »koshka» of the western coast, which are more eutropy, it may be more common.

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland and northern Scandinavia southwards at least to Scotland, Brandenburg and southern Russia. Asia: from the mouth of Yenisei southwards at least to Tomsk prov., Irkutsk prov., northern Mongolia, Kirin prov., Saghalin and Kamtchatka. N. America: from Washington to Quebec southwards to Utah, Colorado and New York (acc. to RYDB.). W. Greenland. S. America: Bolivia.

551. ***Callitriche verna*** L. emend. LÖNNROTH, Obs. crit. (1854) p. 17.

SAMUELSSON in Veröff. Geobot. Inst. Rübel Zürich Heft 3, Festchrift SCHRÖTER p. 623.

South Kamtchatka: The hot springs at Savan R. 110 m. Juli 31st 1921 HN No. 2513 sub *C. subanceps* n. sp. (det. V. PETROV); the hot springs at upper Karymchina R. 400 m. Sept. 10th 1921 HN No. 3096; 10 km. W. of Bolsheredsk Aug. 24th 1921 HN No. 2949; the hot springs at Paratunka June 17th 1921 HN No. 1773; Lake Natchika KOMAROV 1908; above Savoiko KOMAROV 1908.

East Kamtchatka: Near the mouth of Vahil R. KOMAROV 1909; Jurtochnaja R. KOMAROV 1909; the mouth of Korenevskaja. R. KOMAROV 1909; Uzon crater KOMAROV 1909.

Central Kamtchatka: Pushtchina KOMAROV 1909; Mashura KOMAROV 1909; the hot springs Kipploje KOMAROV 1909.

»Kamtchatka»: KASTALSKY.

In South Kamtchatka this plant occurs chiefly at the hot springs. In the material several local forms occur.

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland, northernmost Scandinavia and Kola southwards at least to Corsica and the Alps. Asia: throughout the continent to Kamtchatka and Japan, southwards to southern China and Formosa. America: throughout the continent southwards at least to California, Colorado and Virginia. E. and W. Greenland.

Empetraceae LINDL.

552. ***Empetrum nigrum*** L., Sp. pl. ed. I (1753) p. 1022.

KRASCHENINN., Kamtsch. p. 101; STELLER in PALLAS, Neue Nord. Beytr. II (1781) p. 300 (»*Empetrum*»); PALLAS in Stralsund. Mag. II (1768) p. 169 (»*Empetrum*»); PENNANT, Arct. Zool. (1784) p. CXVI; PALLAS, Fl. Ross. I: 2 p. 49; GEORGI, Beschreib. III: 5 p. 1340; LANGSDORFF, Bemerk. p. 229; MERTENS, Bemerk. Fl. Koragins p. 62; CHAMISSO in Linnaea I (1826) p. 538; CHAMISSO, Reise u. d. Welt p. 347; HOOK. & ARNOTT in Beechy's Voy. p. 116; ERMAN, Verzeichn. p. 59; KITTLITZ, Denkw. II pp. 321, 350, 377, 394; LEDEB., Fl. Ross. III p. 555; HERDER Pl. Radd. Apet. III No. 111 in Acta Horti Petrop. XI: 2 (1892) p. 350; MIYABE, Fl. Kuril. p. 260; YABE & YENDO, Fl. Shimushu p. (187); DITMAR, Reisen I pp. 306, 312, 540, 609 et II pp. 92, 93, 94 (also »*Empetrum*»); BARRET HAMILTON,

A visit to Karaginsky Isl. p. 299 (»*Empetrum*»); KOIDZ., Pl. Yokoyam. p. 214; KOM., Voy. Kamtch. pp. 56, 380, 455 et Fl. Penins. Kamtsch. I pp. 36, 333; KRISTOFOVITCH in Fl. As. Ross. Vyp. 5 (1914) p. 2; KUDO, Fl. Paramush. p. 129. »*Empetrum procumbens* L. h. Cliff. 470. . .» GMEL., Fl. Sib. III p. 16.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka June 24th 1920 HN No. 150; Ozernaja BEZAIS 1909; N. of Illina volcano noted in A. 207; N. E. of Javina noted in A. 95; between Javina and Kochegochek noted in A. 91, A. 94; S. of Kidipalok R. noted in heath by HN; near Sahach volcano noted in A. 191; middle Kusingen R. in heath noted by HN; Kochegochek noted in A. 213; lower Kochegochek R. noted in A. 90 b; between Kochegochek and Golygina noted in A. 102; lower Golygina R. in heath noted by HN; S. of Golygina noted by HN; Golygina village in heath noted by HN; upper Ksudach R. noted by HN; between the mouths of Golygina and Opala rivers in heath noted by HN; 5 km. N. of Opala village noted in A. 214; the western Shadutka R. A. 82; the divide between Shadutka and Savan rivers noted in A. 79, A. 81; Savan Mts. noted in A. 78 c; Lake Kambolnoje noted in A. 218; the mouth of Artemjeva R. noted in A. 220; Akhomten Bay noted in A. 33; Gorelaja volcano 600 m. noted in A. 162, A. 167, A. 169, do. 950 m. noted in A. 172, A. 173; Lake Tolmachovaja noted in A. 160; upper Abshen R. noted by HN; Opala volcano noted in A. 70 a; the mouth of Bolshaja R. June 6th 1922 HN No. 3778; do. noted in A. 45, A. 46, A. 49, A. 51; N.E. of the mouth of Bolshaja R. noted in A. 104; lower Bolshaja R. noted in A. 108, A. 109 a, A. 110; lower Tolmachovaja R. noted in A. 156; lower Karymchina R. noted in *Carex—Rubus chamaemorus—Vaccinium—Empetrum* ass. by HN; the mouth of Ipelka R. noted in A. 58, A. 59; between the mouth of Bolshaja R. and Bolsheredsk acc. to. KOM. loc. cit.; S. of Bolsheredsk noted by HN; Apatcha village in *Carex—Rubus chamaemorus—Vaccinium—Empetrum* ass. noted by HN; »Aljochkin tundra» (Paratunka R.) KOMAROV 1908; between Paratunka and Mikisha KOMAROV 1908; Bogatyrjovka July 16th 1920 HN No. 451 a; Natchika acc. to KOM. loc. cit.; Mt. Zerkalo, Natchika noted in A. 117; »Avatcha Bay» acc. to HOOK. et ARNOTT loc. cit.

East Kamtchatka: Petropavlovsk CHAMISSO acc. to CHAM. loc. cit., do. RUBINSKI 1908, do. PERFILJEF 1910; between Petropavlovsk and Savoiko July 9th 1920 HN No. 384; between Petropavlovsk and Avatcha Volcano Aug. 6th 1920 HN No. 760, do. Aug. 24th 1920 HN No. 1070 (infected by *Melasmia Empetri* MAGN.), do. noted in A. 16; Haliger acc. to KOM. loc. cit.; between Petropavlovsk and Semjatchik along the shore here and there acc. to KOM. loc. cit.; Lake Kronoki acc. to KOM. loc. cit.; Ustj Kamtchatka AFANASEJEV 1909, do. July 1925 MALAISE No. 489.

Commander Islands: Bering Island STELLER acc. to STELLER loc. cit., KJELLMAN, DYBOVSKY 1879, DOBROTVORSKY 1881, GREBNITZKY 1894, PROTOPOPOF 1909 and acc. to FEDTSCH. loc. cit. STEJNEGER; Copper Island DY-

BOVSKY 1879, DOBROTVORSKY 1881, »from the Governor 1887» and STEJNEGER acc. to FEDTSCH. loc. cit.

Central Kamtchatka: Malka acc. to. KOM. loc. cit.; the Ganala »tundra» acc. to KOM. loc. cit.; between Ganala and Pushtchina GRINOP 1909; Svetloj Klutch R. May 22nd 1925 MALAISE No. 488; Klutchi AFANASEJEV 1909, do. PROTOPOPOF 1909.

West and North Kamtchatka: Utka RUBINSKI 1909; Krutugorovaja BEZAIS 1909; Tigil GUDZENKO 1910; between Sedanka and Jelovka BEZAIS 1909; Uka Sept. 14th 1920 KOZLOVSKY (Hb. Holm.); Pallan SAVTCHENKO; Karaginsk Island MERTENS, do. LOGINOVSKI 1910.

»Kamtchatka»: KRASCHENINNIKOF acc. to KRASCH. loc. cit., MERK acc. to HERDER loc. cit., LANGSDORFF, ESCHSCHOLTZ, LUBARSKY acc. to HERDER loc. cit., STEWART, KASTALSKY, KUSMISCHEFF acc. to HERDER loc. cit., PETERS, RIEDER.

Noted in the following associations:

In *Vaccinium—Empetrum*—Moss. ass.:
Abundant (A. 16, A. 172); Profuse (A. 95, A. 104, A. 108, A. 156, A. 214, A. 218).

In *Vaccinium—Empetrum—Rhododendron chrysanthum* ass.:
Single (A. 173); Sparse (A. 117); Scattered (A. 169); Abundant (A. 167); Profuse (A. 162).

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 90 b); Sparse (A. 70 a, A. 82, A. 78 c); Scattered (A. 207); Abundant (A. 94); Profuse (A. 102, A. 160, A. 213).

In *Carex—Rubus chamaemorus—Vaccinium—Empetrum* ass.:
Abundant (A. 45, A. 46, A. 58, A. 59 a, A. 109 a); Profuse (A. 49, A. 51, A. 220).

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 79, A. 91); Abundant (A. 191).

In *Carex—Myrica* ass.:
Single (A. 110).

In *Pinus pumila—Rhododendron*—Moss ass.:
Single (A. 81); Abundant (A. 33).

In South Kamtchatka *E. nigrum* is very common in the heaths and bogs as well in the lowlands as in the alpine region. It flowers in the beginning of June. A form with light-reddish fruits was observed between Petropavlovsk and Avatcha volcano. The old Kamtchadal name of the plant was, acc. to KITTLITZ, »Euneuetch». Recently (Dansk Bot. Ark. 5 No. 2, 1927 p. 1—17) HAGERUP divided *E. nigrum* into two circumpolar species, one more northern tetraploid, bisexual species *E. hermaphroditum* (LGE) HAGERUP and one diploid unisexual species, for which he retains the name *E. nigrum*. All fruiting specimens in my collection are unisexual.

Type of distribution: Circumpolar.

Geographical area (of *E. nigrum* sensu LINNAEUS): Europe: from Iceland, Spitzbergen and Nova Zembla (less common to the north), southwards to Ireland, England, northern Germany and central Russia, in the mts. to the Pyrenees, the Apennines, the northern Balkans and Caucasus. Asia: along the North Coast to Chukch Penins., southwards in the mts. to Altai, northern Mongolia, Ussuri, Saghalin and Honshu, also in Asia Minor and in Corea. America: from the north coast of Alaska over the Arctic Archipelago to Ellesmereland, Labrador and Newfoundland southwards in the mts. to California (42° N. lat.), the Great Lakes and New Hampshire (44° N. lat.) — (in E. America also var. *andinum* DC.). Greenland to about 80° N. lat. In E. and S. America the closely related species *E. Eamesii* FERN. & WIEG., *E. atropurpureum* FERN. & WIEG. and *E. rubrum* VAHL.

Balsaminaceae LINDL.

553. ***Impatiens noli tangere*** L., Sp. pl. ed. I (1753) p. 938.

South Kamtchatka: Haikovaja village noted by HN; Apatcha village at the ford noted by HN; Paratunka RIEDER 1833; Nikolajevsk Aug. 11th 1920 HN No. 843; the shore of »Natchika» R. RUBINSKI 1909; Palovinaja R., Savoiko KOMAROV 1909; Savoiko July 5th 1920 HN No. 247 c.

East Kamtchatka: Petropavlovsk MERTENS, do. PERFILJEF 1910, do. July 21st 1920 HN No. 552.

Central Kamtchatka: Milkova BEZAIS 1908; Mashura GRINOP 1909; Shtchapina KOMAROV 1909, do. July 21st 1920 HN No. 3463 (MALAISE).

»Kamtchatka»: KUSMISCHEFF.

This plant was only seen in the neighbourhood of human habitations and it is doubtful if it is indigenous within our area. It flowers at the end of July and in August.

Type of distribution: Eurasiatic, transgressing into Western America.

Geographical area: Europe: from southern Norway, central Finland and northern Russia southwards to France, the northern Balkans and central Russia, also in Caucasus. Asia: at Yenisei from about the Arctic Circle, from Ochotsk and Kamtchatka southwards to Dshungarski Alatau, northern Mongolia, northern China, Corea and southern Japan; also in Asia Minor. America: Alaska to Washington and (introduced) also reported from Ottawa.

Guttiferae JUSS.

Hypericum Ascyron L.

MAXIM. in Mél. Biol. XI (1881) p. 162; KOM., Fl. Mansh. III p. 40; PRINTZ, Veg. Sib.-Mong. Front. p. 322.

MAXIMOVICZ reports this plant as having been collected by KEGEL in Kamtchatka. It should most probably be excluded from the flora of our area.

Hypericum attenuatum CHOISY.

MAXIM. in Mél. Biol. XI (1881) p. 166.

In Hb. Hort. Petrop. a specimen of this species is preserved originally labelled only »Ktch.» later provided with a note in the hand of Prof. KOMAROV: »Kamtchatka KEGEL».

Even MAXIMOVICZ expresses his doubts as to the correctness of the report. The species should most probably be excluded from the flora of our area.

554. ***Hypericum Gebleri*** LEDEB., Fl. Altai. III (1831) p. 364.

East Kamtchatka: About 3 km. from Savoiko July 26th 1928 MALAISE.

Central Kamtchatka: Svetloj klutch R. P. T. NOVOGRABLENOF in litt.; 40 km. N. of Savoiko acc. to P. T. NOVOGRABLENOF in litt.; Kimitina R. 50 km. N. W. from Mashura in *Betula platyphylla* meadow Aug. 8th 1927 P. T. NOVOGRABLENOF (Hb. Holm.).

»Kamtchatka»: »Petropavlovsk MERTENS» (sub *H. Ascyron* in Hb. Acad. Petrop. et Hb. Hort. Petrop., the place is unreliable).

The specimens from Kimitina R. were past flowering. As I have not had Altai specimens available, no critical comparison could be made between the Altai plant and the Kamtchatka plant.

Type of distribution: ?Siberian.

Geographical area: Altai (southern Tomsk prov. and northern Semipalatinsk prov.), and from Udskoj and Saghalin southwards to southern Manchuria, Corea and S. W. Yezo, also in Central Kamtchatka.

555. ***Hypericum kamtschaticum*** LEDEB. in Denkschr. Bot. Ges. Regensb. III (1841) p. 131.

LEDEB., Fl. Ross. I p. 447; MAXIM. in Mél. Biol. XI (1881) p. 170; YABE & YENDO, Fl. Shimushu p. (188); KUDO, Fl. Paramush. p. 130. — »*Hypericum floribus trigynis terminalibus...*» GMEL., Fl. Sib. IV p. 179. — »*Hypericum* GM. Sib. IV 279 No. 3», PENNANT, Arct. Zool. (1784) p. CXVI. — *Hypericum paramushirense* KUDO, Fl. Paramush. p. 130.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: »Lopatka on the east coast of Kamtchatka» RIEDER 1831; S. of Ozernaja R. RUBINSKI 1909; N. of the mouth of Ozernaja R. in meadow noted by HN; 10 km. N. of Javina Aug. 10th 1921 HN No. 2789; uppermost Kusingen R. 360 m. in meadow noted by HN; Golygina village noted by HN; upper Ksudach R. noted by HN; middle Ksudach R. 100 m. Sept. 5th 1921 HN No. 2671; the hot spring at upper Opala R. Aug. 2nd 1922 HN No. 4114; W. of Opala volcano 360 m. July 19th 1921 HN No. 2226; Bolsheredsk KOMAROV 1908, do. July 8th 1921 HN No. 2041; the hot springs at Siku R. KOMAROV 1908; the hot springs at Bannaja R. 440 m. Sept. 12th

1921 Hn No. 3169; Mt. »Garachie Gora» (upper Paratunka R.) Komarov 1908 (Hb. Berol.); the hot springs at Natchika Komarov 1908.

East Kamtchatka: Petropavlovsk Mt. Petrovska July 15th 1925 P. T. Novograblenof (Hb. Holm.).

»Kamtchatka»: Peters, »Tigil Levitzky» not original label, the place is certainly not correct.

This plant grows only in the southern part of the Kamtchatka Penins., where it is found here and there, but always somewhat scattered. It flowers from the beginning of July to the end of September. The plant described by Kudo as *H. paramushirense* differs from *H. kamtschaticum* in having leaves with lucid and not with black punctation. To me it seems to be merely a variety of *H. kamtschaticum*.

Hn No. 3169 is a low-grown form collected on the salt (alkaline) soil of a hot spring corresponding to similar hunger-forms of several other species.

Type of distribution: Asiatic Pacific.

Geographical area: from southern Kamtchatka over the Kuriles to southern Yezo.

Elatinaceae Lindl.

556. ***Elatine Hydropiper*** L., Sp. pl. ed. I (1753) p. 367.

South Kamtchatka: Lake Natchika Komarov 1908. The specimen belongs to var. *orthosperma* Düb.

Type of distribution: Eurasiatic.

Geographical area: Europe: from northern Sweden, central Finland and northern Russia southwards to Spain, Italy and southern Russia. Asia: known from some few localities in Tobolsk prov. (Surgutsk distr.), Tomsk prov. (Zmjeinogorsk distr.), Yeniseisk prov. (Yeniseisk distr.), Amur Prov. (between Zeia and Bureja) and Kamtchatka. A map of the distribution (*E. Hydropiper* and *E. orthosperma* on different maps) is given by Kosinski in Fl. As. Ross. Vyp. 14 (1917) Tab. VI and VII.

557. ***Elatine triandra*** Schkuhr, Bot. Handb. I (1791) p. 345 tab. 109 b, fig. 2.

Kosinski in Fl. As. Ross. Vyp. 14 (1917) p. 19.

East Kamtchatka: The mouth of Koronevski R. Komarov 1909.

Type of distribution: ?

Geographical area: Europe: from northern Sweden, central Finland and northern Russia southwards to France and southern Russia (not in Switzerland) Asia: known from some few localities in Manchuria and Corea; also in Kamtchatka. America: from Washington to Illinois, southwards to Colorado. The report from S. America is hardly correct.

Violaceae DC.

By W. Becker and E. Hultén.

558. ***Viola avatschensis*** Bckr. et Hult. in Sv. Vet. Ak., Ark. f. Bot. 22 A No. 3 (1928) p. 1.

South Kamtchatka: Sources of Kidipalok R. 1000 m. Sept. 3rd 1922 Hn No. 4459 b; Shadutka volcano 1125 m. Aug. 2nd 1921 Hn No. 2579; between Savan and Shadutka noted in A 80; Opala volcano 1040 m. July 23rd 1921 Hn No. 2319 (A. 71); Lake Tolmachovaja 600 m. July 11th 1922 Hn No. 3911; Mt. Taburett, western summit, (Natchika) Aug. 2nd 1924 P. T. Novogroblenof.

East Kamtchatka: Avatcha volcano 900 m. July 30th 1920 Hn No. 582 a; the Chartchina Mts. Aug. 12th 1927 Malaise.

Central Kamtchatka: Mt. Kaknan (near Korjatskaja volcano) July 18th 1908 Komarov (sub *V. biflora* in Hb. Hort. Bot. Petrop., do. Hb. Berol. in part — the fruit specimen); Korjatskaja volcano Aug. 13th 1928 W. Eyerdam.

Noted in the following association:

In *Artemisia arctica—Solidago—Salix* »*arctica*» ass.:
Single (A. 71, A. 80).

For further notes see Bckr. et Hult. loc. cit. p. 1—2. The species is illustrated in Pl. I fig. f, g.

Type of distribution: ?

Geographical area: It is for the present not possible to give the area of this species as formerly it certainly passed as *V. biflora*. Known with certainty only from our area.

559. ***Viola biflora*** L., Sp. pl. ed. I (1753) p. 936.

Gingins in Linnaea I (1826) p. 407; Mertens, Bemerk. Fl. Koragins p. 63; Ledeb., Fl. Ross. I p. 254; Regel in Pl. Radd. Dicotyl. Polypet. No. 263, Bull. Mosc. 34: 2 (1861) p. 498 et in Radde, Reisen I: 2 p. 253 pro max. parte (excl. β); Maxim. in Bull. Ac. Imp. Sc. St.-Petersb. XXIII (1877) p. 334; Yabe & Yendo, Fl. Shimushu p. (187); Fedtsch., Fl. Îl. Comm. p. 43; Becker in Fl. As. Ross. Vyp. 8 (1915) p. 89; Becker in Beih. Bot. Centralbl. 36: 2 1918 p. 39; Kudo, Fl. Paramush. p. 132; Bckr. et Hult. in Sv. Vet. Ak., Ark. f. Bot. 22 A No. 3 p. 2.

Northern Kuriles: Paramushir I. Matsubara 1915, Kudo 1920 acc. to Kudo loc. cit.; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka, west coast, June 22nd 1920 Hn No. 120; lower Ozernaja R. noted in A. 96; between Javina and Kochegochek noted in A. 91, A. 92; sources of Kidipalok R. 1000 m. Sept. 3rd 1922 Hn No. 4458; upper Kusingen R. noted in A. 190; the junction of Golygina and

Ksudach R. noted in A. 89, A. 90; between Kochegochek and Golygina 90 m. Aug. 9th 1921 Hn No. 2783; upper Ksudach R. Aug. 5th 1921 Hn No. 2654 b, (A. 84); middle Ksudach R. Aug. 6th 1921 Hn No. 2702 (A. 86); Lake Sterbot at the shore Sept. 12th 1922 Hn No. 4573 (A. 215); S. of Zykovaja noted in A. 217; Topik volcano 580 m. July 28th 1921 Hn No. 2471 b; upper Opala R. noted in A. 182; Udoshk R. noted in A. 78 b; Opala volcano 620 m. July 21st 1921 Hn No. 2246 (A. 73, A. 77, A. 78 a); N.W. of Opala volcano noted in A. 66; Lake Tolmachovaja noted by Hn; middle Karymchina R. noted in A. 123; Agashka R. 250 m. July 16th 1921 Hn No. 2179; do. noted in A. 63, A. 64; the hot springs at Siku R. noted in A. 122; Bolsheredsk 40 m. July 8th 1921 Hn No. 2055; do. July 11th 1921 Hn No. 2113; do. June 13th 1922 Hn No. 3793; between Bolsheredsk and Apatcha noted in A. 113; Apatcha in *Thalictrum* meadow noted by Hn; Mt. Zaikin Mys (Paratunka) Komarov 1908; Paratunka village Komarov 1908; Mt. Zerkalo (Natchika) 670 m. noted in A. 119; Mt. Palovinaja 700 m. (Savoiko) July 8th 1920 Hn No. 337; do. on the top July 14th 1928 W. Eyerdam; Poperochnaja R. Komarov 1908; Korjaka Komarov 1909.

East Kamtchatka: Petropavlovsk 50 m. June 24th 1921 Hn No. 1800; between Petropavlovsk and Avatcha volcano 250 m. June 24th 1921 Hn No. 1792; do. noted in A. 18, A. 43; Klutchevskaja volcano Kozlovski 1909; Ustj-Kamtchatka Malaise 1924.

Commander Islands: Copper Island: Tilman 1890, Grebnitzky 1896, Stejneger, Morozevicz 1903 acc. to Fedtsch. loc. cit.; Tkatchenko July 30th 1911 (Hb. Holm.). Acc. to Stejneger the plant is missing on Bering Island.

Central Kamtchatka: The Ganala »tundra» Komarov 1909.

West and North Kamtchatka: Tigil Levitzky 1848; Pallan June 27th 1927 Longinoff; Karaginsk Island acc. to Meertens loc. cit.

»Kamtchatka»: Stewart and Peters (some of the specimens, the others belong to *V. crassa*), Kusmischeff, Riedek (in Hb. Berol. the two specimens to the left, the right specimen is *V. Selkirkii*, in Hb. Hort. Bot. Petrop. sub *V. rotundifolia*).

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 66, A. 78 b, A. 84, A. 86, A. 91, A. 92, A. 119, A. 182, A. 190); Sparse (A. 96).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 113, A. 122).

In *Betula Ermani—Filipendula—Dryopteris* ass.:
Single (A. 63, A. 64).

In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 18, A. 43).

In *Betula Ermani—Filipendula—Equisetum hiemale* ass.:
Single (A. 90); Sparse (A. 89).
In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Sparse (A. 215, A. 217).
In *Carex—Sanguisorba*—Moss ass.:
Single (A. 123).
In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Single (A. 77, A. 78 a).
In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 73).

In South Kamtchatka *Viola biflora* is a very common plant, being nearly always present in the undergrowth of the meadows both in the lowlands and in the mountains up to more than 1000 m. and also occurring in the *Betula* forests. The specimens in the lowland meadows are often sterile.

Usually only one flower is developed, the other being represented by a small bud which never develops into a flower. The leaves are thin, usually considerably broader than long. (Characteristic for *V. biflora* in eastern Asia). They are hairy on the upper side, especially on the lateral lobes; on the underside the veins are hairy.

The plants flower from the middle of June to the middle of August.

Type of distribution: Eurasiatic, transgressing into Western America.

Geographical area: Europe from northernmost Scandinavia, Kolgujef and Vaigatch southwards in the mountains to the Pyrenees, Corsica, the Apennines, Serbia, Bulgaria and Caucasus, not in England, Scotland or Iceland. Asia: in Yenisei and Irkutsk prov. from 62° N. lat., in Jakutsk prov. from 72° N. lat., southwards in the mountains to Afghanistan, Turkestan, Kashmir, Sikkim, Yunnan, Sze-ch'uan, Shensi, Shansi, Chili, Corea and Honshu. America: from the Aleutian Islands and Alaska southwards in the Rocky Mts. to Colorado.

560. ***Viola crassa*** Makino in Bot. Mag. (Tokyo) XIX (1905) p. 87.

Bckr. et Hult. in Sv. Vet. Ak. Ark. f. Bot. 22 A. No. 3 p. 2.

South Kamtchatka: Topik volcano 580 m. July 28 1921 Hn No. 2471 a.

»Kamtchatka»: On one sheet in Herb. Hort. Petrop. provided with two labels: »*Viola biflora* L. v. *typica* teste Regel Kamtchatka Stewart» and »*Viola biflora* L. *α typica* Camtschatka Peters» this species is mixed with *V. biflora*.

V. crassa is closely related to *V. biflora*, from which species it differs *inter alia* by its broad thick glabrous leaves, ovate stipules and dark yellow flowers. During my journeys in South Kamtchatka I only found it once, growing together with *V. biflora* in an alpine meadow.

Type of distribution: Asiatic Pacific.

Geographical area: South Kamtchatka and acc. to KUDO (The Vegetation of Yezo) northern and southern Kuriles, Yezo, Honshu and Korea.

561. ***Viola crassicornis*** BCKR. et HULT. in Sv. Vet. Akad. Ark. f. Bot. 22 A. No. 3 (1928) p. 3.

South Kamtchatka: Between Bolsheredsk and Apatcha June 14th 1922 HN No. 3799; Apatcha June 19th 1922 HN No. 3829.

East Kamtchatka: Petropavlovsk June 1st 1921 HN Nn. 1600, do. June 8th 1921 HN No. 1642 and 1649 (type specimen).

Central Kamtchatka: Klutchi June 2nd 1921 HN No. 3313 (MALAISE), do. June 5th 1927 MALAISE.

For notes see BCKR. et HULT. loc. cit. pp. 3—4. The species is illustrated in Pl. I fig. h.

Type of distribution: ?

Geographical area: So far only known from our area.

Viola crassicornis × ***Selkirkii*** BCKR. et HULT.

BCKR. et HULT. in Sv. Vet. Ak. Ark. f. Bot. 22 A. No. 3 p. 4.

East Kamtchatka: Petropavlovsk June 6th 1921 HN No. 1636, do. June 14th 1921 HN No. 1679.

These specimens were growing among the parent-species on Mt. Meshennyi near the churchyard.

562. ***Viola epipsila*** LEDEB., Ind. sem. hort. Dorpat (1820) p. 5.

subsp. ***repens*** (TURCZ.) W. BCKR. in Bot. Centralbl. Beiheft 34: 2 (1917) p. 406.

BCKR. in Fl. As. Ross. Vyp. 8 (1915) p. 58; BCKR. et HULT. in Sv. Vet. Ak. Ark. f. Bot. 22 A. No. 3 p. 4. — *Viola repens* TURCZ. in Bull. Soc. Nat. Mosc. (1838) p. 88; KUDO, Fl. Paramush. p. 131. — *Viola epipsila* REGEL in Pl. Radd. Dicotyl. Polypet. No. 257 Bull. Mosc. 34: 2 (1861) p. 478 et RADDE, Reisen I: 2 p. 233. — *Viola palustris*[1] GEORGI, Beschreib. III: 4 p. 800 quoad pl. Kamtsch.; YABE & YENDO, Fl. Shimushu p. (187); KOM., Voy. Kamtch. p. 413. — *Viola palustris* var. *epipsila* MAXIM. in Bull. Ac. Imp. Sc. St. Petersb. XXIII (1877) p. 323; FEDTSCH., Fl. Îl. Comm. p. 42. — »A local form of . . . *Viola palustris*» KOM., Fl. Penins., Kamtsch. I p. 332.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka W. coast June 19th 1920 HN No. 67; lower Ozernaja R. Aug. 12th 1921 HN No. 2827; Assatcha Mts. 4—500 m. July 31st 1922 HN No. 4106 (A. 177); Upper Opala R. noted in A. 181;

[1] *Viola palustris* LEDEB., Fl. Ross. I p. 247 and CHAM. in Linnaea 2, p. 146 are undoubtedly this species, but the specimens on which those reports were founded were collected by REDOWSKY, who never visited the Kamtchatka peninsula.

Lake Kambolnoje Sept. 15th 1922 Hn No. 4616 (A. 221); Akhomten Bay Sept. 10th 1920 Hn No. 1229 a; do. 250 m. Sept. 11th 1920 Hn No. 1290, do. 120 m. Sept. 22nd 1920 Hn No. 1468; Gorelaja volcano 800 m. July 23rd 1922 Hn No. 3990; Lake Tolmachovaja 600 m. July 11th 1922 Hn No. 3918; Ipelka R. 100 m. July 14th 1921 Hn No. 2158; Bolsheredsk July 8th 1921 Hn No. 2058, do. June 13th 1922 Hn No. 3787 and 3791; Mt. Trubi (Viljui valley) Komarov 1908; Tarja Bay »Mys Kutcha» Komarov 1908; Mt. Palovinaja 700 m., Savoiko July 8th 1920 Hn No. 344.

East Kamtchatka: Petropavlovsk July 17th 1920 Hn No. 480, do. July 21st 1920 Hn No. 553, do. June 5th 1921 Hn No. 1628, do. June 29th 1928 W. Eyerdam; Sierroglaska Komarov 1908; between Petropavlovsk and Savoiko July 9th 1920 Hn No. 383; between Petropavlovsk and Avatcha volcano 250 m. Aug. 21st 1920 Hn No. 987, do. 300 m. June 24th 1921 Hn No. 1780, do. 250 m. June 24th 1921 Hn No. 1816; Avatcha volcano 675 m. Aug. 4th 1920 Hn No. 746; Klutchevskaja volcano Kozlovski 1909, do. Kurtaschof 1909; Lake Assabatch Malaise Aug. 1925; Nishne-Kamtchatsk Bezais 1908; Ustj-Kamtchatka Malaise 1925.

Commander Islands: Bering Island: Kjellman, Dybovsky 1879; Copper Island: Grebnitzky acc. to Fedtsch. loc. cit.

Central Kamtchatka: Malka Komarov 1909; Kashkan R. Komarov 1909; Verschne-Kamtchatsk Komarov 1909; between Klutchi and Kamaki Bezais 1908.

West and North Kamtchatka: Tigil Levitzky.

»Kamtchatka»: Rieder acc. to Regel loc. cit.

subsp. ***repens*** var. ***palustroides*** (W. Bckr.) Bckr. et Hult. in Sv. Vet. Ak. Ark. f. Bot. 22 A No. 3 (1928) p. 4.

V. epipsila subsp. *palustroides* W. Bckr. in Fedde, Rep. XVII (1921) p. 72; W. Bckr. in Beih. Bot. Centralbl. 40: 2 (1923) p. 146. — *Viola palustris* Regel in Pl. Radd. Dicotyl. Polypet. N. 256, Bull. Mosc. 34: 2 (1861) p. 478 et Radde, Reisen I: 2 p. 233.

South Kamtchatka: Assatcha Mts. 800 m. Aug. 10th 1922 Hn No. 4194; Opala volcano 625 m. July 21st 1921 Hn No. 2252; Mt. Palovinaja 700 m., Savoiko July 8th 1920 Hn No. 340, 341, 342, 343.

»Kamtchatka»: Rieder.

V. epipsila subsp. *repens* was noted in the following associations:

In *Carex—Sanguisorba*—Moss ass.:
Single (A. 181, A. 221).

In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 177).

In South Kamtchatka *Viola epipsila* subsp. *repens* is a common plant in the wet meadows and along brooks up to about 800 m. The var. *palustroides* seems to be a mountain form. As I always tried to collect all forms of this var. that I came across during the journey and only succeeded in getting the few specimens enumerated above, it must be a comparatively rare plant.

Type of distribution: The entire species: Eurasiatic, transgressing into Western America. Subsp. *repens*: Asiatic—Western American.

Geographical area: The type: Europe: from northern Scandinavia, Kanin and Kolgujef southwards to Denmark, Pomerania, Silesia, Hungary, Poland, central Russia to Kazan and Orenburg. Asia: Tobolsk.

Subsp. *repens*: Asia: from the Obi Bay, at Yenisei from Dudinka and from the Chukch Peninsula southwards to southern Tomsk, the Sajan Mts., Transbaikalia, Manchuria, Ussuri, Saghalin and the Kurile Islands. America: Alaska (Mc Donald Creek, Kodiak, Golovin, Yakutat Bay, Sitcha reported as *V. palustris* or *V. Langsdorffii*) (Var. *palustriformis*: Kamtchatka and Alaska (Hyder) K. WHITED No. 1189 1924 sub *V. Langsdorffii*).

Viola glabella NUTT.

MAXIM. In Bull. Ac. Imp. Sc. St. Petersb. XXIII (1877) p. 310; W. BECKER in Beiheft. Bot. Centralbl. 36: 2 (1918) p. 51; NAKAI in Bot. Mag. Tokyo 33 (1919) p. 134.

The above-mentioned report of *V. glabella* from Kamtchatka was founded on a report of »*V. biflora β sitchensis*» by REGEL, Pl. Radd. Dicotyl. Polyp. No. 263 in Bull. Mosc. 34: 2 (1861) p. 498 and in RADDE, Reisen I: 2 p. 253 reading: »Kamtschatka (Herb. FISCHER sub *V. biflora β acutifolia*)».

No Kamtchatka-specimens of this species were seen and the plant must certainly be excluded from the flora of the peninsula — a fact already mentioned by MAXIM. loc. cit.

Viola hirta L. var. **japonica.**

MAXIM. in Bull. Ac. Imp. Sc. St. Petersb. XXIII (1877) p. 327.

According to MAXIMOVICZ, one Kamtchatka-specimen of this species was found in Hb. FISCH.

The species must certainly be excluded from the flora of Kamtchatka.

563. ***Viola Hultenii*** W. BCKR. in Sv. Vet. Ak. Ark. f. Bot. 22 A. No. 3 (1928) p. 4.

Viola rotundifolia β pallens GING. in DC., Prodr. I (1824) p. 295 (quoad pl. Kamtsch.) non BANKS; LEDEB., Fl. Ross. I (1842) p. 248; MAXIM. in Bull. Ac. Imp. Sc. St. Petersb. XXIII (1877) p. 339 et in Mél. Biol. IX p. 755. — *Viola blanda* REGEL in Pl. Radd. Dicotyl. Polypet. No. 258 in Bull. Mosc. 34: 2 (1861) p. 479 et RADDE, Reis. I: 2 p. 234, Tab. VI, fig. 21—23; MAXIM. in Bull. Ac. Imp. Sc. St. Petersb. XXIII (1877) p. 310 quoad pl. Kamtsch.; W. BECKER in Fl. As. Ross. Vyp. 8 (1915) p. 59; W. BECKER in Beih. Bot. Centralbl. 34: 2 (1917) p. 402; KUDO, Fl. Paramush. p. 131.

Northern Kuriles: Paramushir KUDO 1920.

South Kamtchatka: Lower Ozernaja R. Aug. 12th 1921 HN No. 2835; Kusingen R. Aug. 17th 1922 HN 4292; the Paratunka »tundra» KOMAROV 1908; Lake Blichne N.W. corner KOMAROV 1908 (sub *V. blanda*).

East Kamtchatka: Kalashtyrka valley KOMAROV 1909; between Petropavlovsk and Avatcha volcano 250 m. June 24th 1921 HN No. 1815; »An Füssen der Kamtschatischen Sopka» (Klutchevskaja volcano) RIEDER 1831.

»Kamtchatka»: KUSMISCHEFF and acc. to REGEL loc. cit. RIEDER and PETERS.

In South Kamtchatka *V. Hultenii* is a comparatively rare plant found occasionally in the *Sphagnum* bogs. By the very thin rhizom beset with brown scales (stipule with the rest of the petiole belonging to them) and with leaves separated from each other and provided with very small brown stipules, this plant differs considerably from *V. blanda* WILLD. and other forms closely related to that species. *V. Hultenii* has green capsules, while those of *V. blanda* are reddish.

Type of distribution: ? Asiatic Pacific.

Geographical area: Kamtchatka, Kurile Islands, Yezo and Honshu. A report of »*V. blanda*» from Jakutsk distr. by KOMAROV in Fl. Jakoutie p. 148 may perhaps have originated from a specimen of this species.

564. ***Viola kamtschadalorum*** BCKR. et HULT. in Sv. Vet. Ak. Ark. f. Bot. 22 A No. 3 (1928) p. 6.

Viola Langsdorffii β caulescens GING. in DC., Prodr. I (1824) p. 297. — *Viola mirabilis β Langsdorffii* lus. c.) *caulescens*, d.) *hispidula* et *γ Kusnetzoffii* a.) *glabra* REGEL, Pl. Radd. Dicot. Polypet. No. 260 in Bull. Mosc. 34: 2 (1861) pp. 485, 488 et RADDE, Reisen 1: 2 pp. 240, 243. — *Viola canina γ acuminata* REGEL, Pl. Radd. Dicotyl. Polypet. No. 261 in Bull. Mosc. 34: 2 (1861) p. 492 et RADDE, Reisen 1: 2 p. 247 quoad pl. Kamtsch. — *Viola Langsdorffii* W. BECKER in Fl. As. Ross. Vyp. 8 (1915) p. 60 pro parte; KOMAROV, Voy. Kamtch. p. 413, in Herb. et in Fl. Penins. Kamtsch. p. 332. — *Viola Langsdorffii* subsp. *sachalinensis* W. BECKER in Beih. Bot. Centralbl. 34: 2 (1916) p. 253; W. BECKER in Beih. Bot. Centralbl. 40: 2 (1923) p. 45.

South Kamtchatka: Between Javina and Kochegochek noted in A. 91, A. 92; Sahach volcano noted by HN; upper Ksudach R. noted in A. 85, A. 86, and A. 87; upper Udoshk R. noted in A. 78 b; Opala volcano 300 m. July 20th 1921 HN No. 2240; N.W. of Opala volcano noted in A. 67, A. 68; upper Abshen R. noted by HN; lower Bolshaja R. noted in A. 106, A. 107, upper Karymchina R. noted by HN; middle Karymchina R. noted in A. 123; Bolsheredsk BEZAIS 1909, do. RUBINSKI 1909, do. July 13th 1921 HN. No. 2128; 10 km. W. of Bolsheredsk Aug. 23th 1921 HN No. 2927; between Bolsheredsk and Apatcha noted in A. 113; Apatcha village June 19th 1922 HN No. 3826; the hot spring at Siku R. noted in A. 122; lower Bannaja R. noted in *Angelica ursina* meadow by HN; Mt. Zaikin Mys (Paratunka) KOMAROV 1908; Paratunka village KOMAROV 1908; Mt. Shapotchka (Natchika) KOMAROV 1908; Mt. Zerkalo (Natchika) in an open spot in *Alnus* thickets noted by HN; the

hot spring at Natchika Rubinski 1909; Korjaka village July 10th 1921 Hn No. 3628 (P. T. Novograblenof).

Central Kamtchatka: Malka Komarov 1909; Kamtchatka vershina Komarov 1909; Pushtchina Komarov 1909.

»Kamtchatka»: Stewart, Kusmischeff, Rieder (partly sub *V. canina γ acuminata*). A report from Tigil by Levitzky needs further confirmation, as the place was not given on the original label and the plant is otherwise known only from the southern part of the peninsula.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 67, A. 68, A. 78 b, A. 86, A. 91, A. 92); Sparse (A. 107).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 113, A. 122).

In *Carex—Sanguisorba*—Moss ass.:
Single (A. 87, A. 123).

In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 106).

In South Kamtchatka *V. kamtschadalorum* is characteristic of the alluvial meadows of the lowlands, in which it is scattered here and there but seldom entirely absent. It is a very striking plant, usually between 3 and 4 dm. high with dark-violet, large flowers. Compare the notes by Bckr. et Hult. loc. cit.

Type of distribution: Asiatic Pacific.

Geographical area: Southern part of Kamtchatka Peninsula and Saghalin.

565. ***Viola Komarovii*** W. Bckr. in Beih. Bot. Centralbl. 34: 2 (1916) p. 237.

Kudo, Fl. Paramush. p. 132; W. Bckr. loc. cit. 40: 2 (1923) p. 64; Bckr. et Hult. in Sv. Vet. Ak. Ark. f. Bot. 22 A No. 3 p. 7. — *Viola canina* L. ζ *kamtschatica* Gingins in Linnaea I (1826) p. 407. — *Viola canina* Hook. et Arnott in Beechy's Voy. p. 112. — *Viola silvestris* Ledeb., Fl. Ross. I p. 253 quoad pl. Kamtsch. — *Viola canina β sylvestris* Regel, Pl. Radd. Dicot. Polyp. No. 261 in Bull. Mosc. 34: 2 (1861) p. 490 et in Radde, Reisen I: 2 p. 245 quoad pl. Kamtsch. — *Viola canina δ rupestris* Regel, loc. cit. p. 495 et 250 quoad pl. Kamtsch. — *Viola sylvestris α typica* et *β rupestris* Maxim. in Bull. Ac. Imp. Sc. St. Petersb. XXIII (1877) p. 330 quoad pl. Kamtsch. — *Viola sylvestris* var. *typica* Yabe & Yendo, Fl. Shimushu p. (187). — *Viola rupestris* var. *glaberrima* Bckr. in Fl. As. Ross. Vyp. 8 p. 38 quoad pl. Kamtsch. — *Viola sachalinensis* Bckr. in Fl. As. Ross. Vyp. 8 p. 41 quoad pl. Kamtsch. — ?*Viola canina* Bckr. in Fl. As. Ross. Vyp. 8 p. 45 quoad pl. Kamtsch.

Northern Kuriles: Paramushir acc. to Kudo loc. cit.; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka W. coast June 22nd 1920 Hn No. 121, do. June 24th 1920 Hn No. 129; Kambolnaja R. Bezais 1909; lower Ozernaja R. Aug. 13th 1921 Hn No. 2856 (A. 100); between Javina and Kochegochek noted in A. 91, A. 92; between Kochegochek and Golygina Aug. 9th 1921

Hn No. 2782; Kusingen R. Aug. 17th 1922 Hn No. 4288; near Sahach volcano noted in A. 191; upper Ksudach R. 125 m. Aug. 4th 1921 Hn No. 2654 a (A. 83); the hot spring at Shadutka R. Aug. 12th 1922 Hn No. 4235; Assatcha Mts. 300 m. Aug. 9th 1922 Hn No. 4179; upper Opala R. noted in A. 185; Tikhirka Bay Rieder 1831 (sub *V. canina β sylvestris*); Shirovaja Bay Rieder 1831 (sub *V. montana* and *V. canina β sylvestris* a. *vulgaris*); near the mouth of Bolshaja R. July 4th 1921 Hn No. 1930; middle Karymchina R. 220 m. Sept. 6th 1921 Hn No. 3066; lower Karymchina R. noted in A. 124; Apatcha village June 19th 1922 Hn No. 3827; »Alochkin tundra» (Paratunka R.) Komarov 1908; Mt. Zaikin mys (Paratunka) Komarov 1908; Tarja Bay Komarov 1908, do. Rubinski 1909; Bogatyrjovka (Avatcha Bay) July 16th 1920 Hn No. 457; Avatcha village, Savitch 1908; Poperochnaja R. Komarov 1908.

East Kamtchatka: Petropavlovsk Chamisso 1816 (sub »*V. canina ζ kamtschatica*» later »*V. silvestris* L. Ledeb.» Hb. Berol.), do. Stewart (sub »*V. silvestris* herb. Ledeb.»), do. Komarov 1908, do. Savitch 1909, do. Perfiljef 1910, do. Gudzenko 1910, do. Aug. 17th 1920 Hn No. 923, do. June 1st 1921 Hn No. 1602 and 1609, do. June 6th 1921 Hn No. 1637 and 1638, do. June 8th 1921 Hn No. 1650, do. June 13th 1921 Hn No 1668, do. June 14th 1921 Hn No. 1684 and 1706, do. June 19th 1922 P. T. Novograblenof; between Petropavlovsk and Avatcha volcano 250 m. June 24th 1921 Hn No. 1805; Avatcha volcano 900 m. July 30th 1920 Hn No. 578 and 582, do. noted at 1200 m. by Hn; Nishne-Kamtchatsk Bezais 1908.

Central-Kamtchatka: Gremushej R. (near Korjatskaja volcano) Komarov 1908; Svetloj Klutch R. (100 verst S.W. of Tolbatchik) May 25th 1925 Malaise; Klutchi June 14th 1922 Hn No. 3348 (Malaise), do. June 19th 1921 Hn No. 3363 and 3394 (Malaise).

West and North Kamtchatka: Tigil Levitzky (no place mentioned on the original label).

»Kamtchatka»: Eschscholtz (sub *V. canina*), Stewart, Kusmischeff (sub *V. canina β sylvestris* c. *sabulosa* teste Regel), Rieder, Postels.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 83, A. 92, A. 100, A. 185, A. 191); Sparse (A. 91).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 124).

In the meadows of South Kamtchatka *V. Komarovii* is a fairly common plant, occurring from the sea level up to 1200 m. It varies considerably in habitus, the spring form being acaulescent, while in summer and autumn the plant has a branched stem with axillary, often cleistogamous flowers. It is very characteristic that the remainder of the stems and leaves of the preceding year are persistent long after the development of the new leaves. The plant flowers in June and has ripe seeds in the middle of August.

V. Komarovii is closely related to *V. sachalinensis* Boiss., from which it differs in its broader leaves and stipules and in larger growth. Transition forms between the two species may exist. *V sachalinensis* (by W. Becker in Beih. Bot. Centralbl. 40: 2 1923 p. 50 called *V. mutsuensis*) should therefore be excluded from »grex *Silvestres*» and united with »grex *Rivinianae*».

Type of distribution: Siberian.

Geographical area: Asia from Tomsk prov. eastwards. At Yenisei from 60° N. lat. and from northern Kamtchatka southwards to northern Mongolia, Amur, Saghalin and Yezo. A map of the distribution is given by Becker in Beih. Bot. Centralbl. 40: 2 (1923) tab. V. In Yezo, Saghalin and Corea the closely related species *V. sachalinensis*.

566. ***Viola Langsdorffii*** Fisch. in DC., Prodr. I (1824) p. 296.

Fedtsch., Fl. Îl. Comm. p. 42; ?Kudo, Fl. Paramush. p. 132; Becker in Fl. As. Ross. Vyp. 8 p. 60 pro parte; Bckr. et Hult. in Sv. Vet. Ak. Ark. f. Bot. 22 A No. 3 p. 7 (also var. *ursina*); Hultén in Sv. Bot. Tidskr. 22 (1928) p. 255; Becker in Beiheft. Bot. Centralbl. 40: 2 (1923) p. 145. — *Viola mirabilis β Langsdorffii* Fisch. a. *subacaulis* et b. *parviflora* Regel, Pl. Radd. Dicotyl. Polyp. No. 260 in Bull. Mosc. 34: 2 (1861) p. 485 et Radde, Reisen I: 2 p. 240; Maxim. in Bull. Ac. Imp. Sc. St. Petersb. XXIII (1877) p. 339 pro parte. — *Viola ursina* Komarov in Fedde, Rep. Spec. Nov. XIII (1914) p. 235; Becker in Beih. Bot. Centralbl. 40: 2 (1923) p. 146.

Northern Kuriles: ?Paramushir Kudo 1920 acc. to Kudo loc. cit.

South Kamtchatka: Kurile Lake Aug. 23rd 1922 Hn No. 4400, do. noted in A. 208, A. 210, A. 211; between Kurile Lake and Kochegochek 800 m. Sept. 3rd 1922 Hn No. 4459 a; near Sholtovskaja volcano Aug. 23rd 1922 Hn No. 4360; Topik volcano 580 m. July 28th 1921 Hn No. 2495; Akhomten Bay 330 m. Sept. 11th 1920 Hn No. 1286, do. 175 m. Hn No. 1382, do. Sept. 21st 1920 Hn No. 1435, do. noted in A. 31; the divide between Savan and Shadutka rivers noted in A. 80; Opala volcano 620 m. July 21st 1921 Hn No. 2242, 2256, 2264, do. 1040 m. Hn No. 2284, do. 1040 m. July 23rd 1921 Hn No. 2363, do. 620 m. July 24th 1921 Hn 2410 (A. 71, A. 73, A. 77, A. 78 a); the Kohelok pass 780 m. Sept. 11th 1921 Hn No. 3128 (A. 125); upper Bystraja R. (Paratunka river system) 480 m. Sept. 13th 1921 Hn No. 3198 (A. 128); Mt. Zaikin Mys (Paratunka) Komarov 1908; Mt. Trubi (Viljui R.) Komarov 1908; Mt. Tshapotcha (Natchika) Komarov 1908; Natchika 830 m. Sept. 3rd 1921 Hn No. 3028; Mt. Zerkalo (Natchika) noted in A. 118; Mt. Palovinaja (Savoiko) 700 m. July 8th 1920 Hn No. 345 and 347, do. at the top Aug. 1st 1928 W. Eyerdam; Poperochnaja R. Komarov 1908.

Commander Islands: Bering Island Dybovsky 1879, Kjellman, and acc. to Fedtsch. loc. cit. Stejneger 1883 and 1897 and Morozevicz 1903; Copper Island Dybovsky 1879 and acc. to Fedtch. loc. cit. Tilman 1890, Grebnitzky 1896, Stejneger and Morozevicz 1903.

»Kamtchatka»: Petropavlovsk Mertens (probably Petropavlovsk district, not the town is meant).

Noted in the following associations:

In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:

Single (A. 211); Sparse (A. 77, A. 78 a, A. 210); Scattered (A. 118, A. 125).

In *Artemisia arctica—Solidago—Salix »arctica»* ass.:

Single (A. 31, A. 71, A. 73, A. 80, A. 128, A. 208).

In South Kamtchatka *V. Langsdorffii* is not rare in the meadows of the alpine region, where it often occurs in masses. The pale lilac-coloured flowers are developed in July. For differences from *V. kamtschadalorum* see under that species. The plant differs somewhat from the specimens from Unalashka and Alaska and may be considered to be a special variety var. *ursina* (Kom.), Bckr. et Hult.

Type of distribution: Northern Pacific.

Geographical area: Asia: ?Jakutsk prov., Kamtchatka, the Kuriles, Yezo. America: the Aleutian Islands and Alaska (Jakutat Bay!, Vindham Bay!).

567. ***Viola Selkirkii*** Pursh ap. Goldie in Edinb. Phil. Journ. VI (1822) p. 324.

Maxim. in Bull. Ac. Imp. Sc. St. Petersb. XXIII (1877) p. 321. pro max. part.; Becker in Fl. As. Ross. Vyp. 8 (1915), p. 72; Becker in Beih. Bot. Centralbl. 34: 2 (1917) p. 412; Kudo, Fl. Paramush. p. 130; Bckr. et Hult. in Sv. Vet. Ak. Ark. f. Bot. 22 A. No. 3 p. 7. — *Viola kamtschatica* Ging. in Linnaea I (1826) p. 406; Ledeb., Fl. Ross. I p. 245; Regel., Pl. Radd. Dicot. Polyp. No. 253 in Bull. Mosc. 34: 2 (1861) p. 472 et in Radde, Reisen I: 2 p. 227 (*α typica* excl. *β, γ*). — *Viola umbrosa* Fr., Kom., Voy. Kamtch. p. 413. — »A local form of . . . *V. umbrosa*», Kom., Fl. Penins. Kamtsch. I p. 322.

Northern Kuriles: Paramushir Kudo 1920.

South Kamtchatka: N.W. of Kurile Lake 600 m. noted by Hn; lower Ozernaja R. noted by Hn; the sources of Unkanakchek R. noted in A. 203; upper Unkanakchek R. noted in A. 199; Sahach volcano 600 m. noted by Hn; middle Kusingen R. noted in A. 194; middle Ksudach R. Aug. 23rd 1921 Hn No. 2724; Assatcha Mts. noted in A. 178; Akhomten Bay 250 m. Sept. 9th 1920 Hn No. 1229 a and b, do. noted in A. 27, A. 28, A. 35; Gorelaja volcano in *Alnus* thickets 600 m. noted by Hn; Opala volcano noted by Hn; lower Bolshaja R. noted in A. 105, A. 107; Udoshk R. in *Filipendula kamtschatica* thickets noted by Hn; Agashka R. 250 m. July 16th 1921 Hn No. 2178; 10 km. W. of Bolsheredsk Aug. 23rd 1921 Hn No. 2912; between Bolsheredsk and Apatcha 100 m. Aug. 30th 1921 Hn No. 2978 b; Apatcha village June 17th 1922 Hn No. 3812; (Paratunka-) Karymchina R. Komarov 1908 (sub *V. umbrosa* var. *Selkirkii*); between Paratunka village and Mikisha Komarov 1908; Mt. Trubi (Vilju R.) Komarov 1908; Mt. Zerkalo (Natchika) noted by Hn, do. noted in the open spots in the *Alnus* thickets; Olchovaja R. Komarov 1909; Poperochnaja R. Komarov 1909.

East Kamtchatka: Petropavlovsk Eschscholtz sub *V. kamtschatica*, do. Mt. Nikolska Komarov May 28th 1908 pro parte, do. Perfiljef 1911,

do. June 5th 1921 Hx No. 1627 b; between Petropavlovsk and Avatcha volcano 250 m. Aug. 28th 1921 Hx No. 1140; Kichpinitch volcano Komarov 1909.

Central Kamtchatka: Mashura Komarov 1909; Shtchapina Komarov 1909.

»Kamtchatka»: Kusmischeff, Rieder, Peters acc. to Regel loc. cit.

var. ***glabrescens*** Bckr. et Hult. in Sv. Vet. Ak. Ark. f. Bot. 22 A. No. 3 p. 8.

Viola kamtschatica Ging. *β glabra* Regel, Pl. Radd. Dicotyl. Polypet. No. 253 in Bull. Mosc. 34: 2 (1861) p. 472 et Radde, Reisen I: 2 p. 227. *Viola carnosula* W. Bcks. in Beih. Bot. Centralbl. 23: 2 (1918) p. 57.

South Kamtchatka: Opala volcano 620 m. July 27th 1921 Hx No. 2419; Mt. Palovinaja 700 m. (Savoiko) July 8th 1920 Hx No. 346.

East Kamtchatka: Petropavlovsk June 6th 1921 Hx No. 1639 a and c.

Central Kamtchatka: Mt. Zerkalo, Malka Protopopof 1908.

Noted in the following associations:

In *Alnus hirsuta—Filipendula—Dryopteris* ass.:
Single (A. 194, A. 199).

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 107); Sparse (A. 105).

In *Alnus—Glyceria—Athyrium* ass.:
Single (A. 28); Sparse (A. 27, A. 35, A. 203).

In *Calamagrostis—Veratrum* ass.:
Single (A. 178).

In South Kamtchatka *Viola Selkirkii* is common all over the country in shady localities, chiefly in the *Alnus* region but also in the lowlands. It is in flower from the beginning of June to the end of July. Var. *glabrescens* seems to be a mountain form found chiefly at high altitudes.

Concerning differences from *V. crassicornis* see under that species.

Type of distribution: Circumpolar.

Geographical area: Europe: In Scandinavia from about the Arctic Circle southwards in Norway to about 60° N. lat. and to central Sweden, Finland. In Russia from Novgorod, Tver, Kostroma and southern Perm to Ingermanland, Smolensk and Kazan, also in Caucasus (acc. to Becker loc. cit.). Asia: from about 59° N. lat. in Tobolsk, Tomsk and Yeniseisk prov. and from Saghalin and middle Kamtchatka southwards to southern Tobolsk, northern Mongolia, Transbaikalia, Chili, Corea and Kiushiu. America: from British Columbia, New Brunnswick and Newfoundland southwards to Colorado, Minnesota, northern Pennsylvania and Massachusetts. E. Greenland.

»**Viola** die wie *uliginosa* aussieht».

Mertens, Bemerk. Fl. Koragins p. 61.

I do not know with certainty to which species Mertens' report should be referred.

Viola uniflora L.

W. BECKER in Fl. As. Ross. Vyp. 8 (1915) p. 92 et in Beih. Bot. Centralbl. 36: 2 (1918) p. 48.

This report was founded on a specimen collected by TILESIUS. As other plants labelled in the same way have proved not to be from Kamtchatka I think that this report is also incorrect and that the species has to be excluded from the flora of the Kamtchatka Peninsula.

Thymelaeaceae REICHB.

568. ***Daphne kamtschatica*** MAXIM. in Primit. Fl. Amur., Mém. Ac. Imp. Sc. St. Petersb. par div. Sav. IX (1859) p. 237.

MAXIM. in REGEL, Gartenflora 1866 p. 34; HERDER, Pl. Radd. Apet. III No. 108 in Acta Horti Petrop. XI (1892) p. 346; KOM., Voy. Kamtch. pp. 12, 193, 412, et Fl. Penins. Kamtsch. I p. 331.

South Kamtchatka: Upper Ksudach R. in meadow noted by HN; Topik volcano noted by HN; middle Opala R. July 27th 1921 HN No. 2445; lower Artemjeva R. in *Betula* forest noted by HN; lower Bolshaja R. noted in A. 106; upper Abshen R. 250 m. July 17th 1921 HN No. 2200; the mouth of Balaganchik R. noted in A. 153; lower Karymchina R. noted in A. 151; middle Karymchina R. in meadow and *Angelica ursina* meadow noted by HN; middle Karymchina R. 300 m. Sept. 8th 1921 HN No. 3077; Ipelka R. July 14th 1921 HN No. 2149; Bolsheredsk S. of the river July 13th 1921 HN No. 2125; 10 km. W. of Bolsheredsk Aug. 23rd 1921 HN No. 2926, do. Aug. 24th 1921 HN No. 2947; between Apatcha and Siku R. noted in A. 150; lower Bannaja R. in meadow and *Angelica ursina* meadow noted by HN; Paratunka KOMAROV 1909 (Hb. Berol.), do. Aug. 21st 1921 HN No. 3643; upper Mikisha R. KOMAROV 1908; Korjaka RIEDER 1831.

East Kamtchatka: Petropavlovsk acc. to KOM. loc. cit. p. 12; the Kalashtyrka valley KOMAROV 1909; the hot spring of Nalutcheva July 31st 1928 W. EYERDAM; between Kronoki and Mashura Okt. 2nd 1921 HN No. 3621 a (MALAISE).

Central Kamtchatka: Near Malka acc. to KOM. loc. cit. p. 193; Ganala KOMAROV 1909, do GRINOP 1909; Klutchi BEZAIS 1908, do. AFANASEJEV 1909, do. PROTOPOPOF 1909, do. June 2nd 1921 HN No. 3312 (MALAISE), do. Nov. 8th 1925 MALAISE No. 491.

West and North Kamtchatka: Kol RUBINSKI 1908; Tigil LEVITZKY. »Kamtchatka»: STEWART (Hb. Berol.), PETERS.

Noted in the following associations:

In *Betula Ermani—Thalictrum—Carex* ass:
Single (A. 106, A. 150).

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 153).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 151).

In South Kamtchatka *D. kamtschatica* is comparatively rare, always occurring as scattered specimens. It inhabits the high shady meadows, especially the *Angelica ursina* meadows, as well as the *Betula* forests.

It flowers very early, already in the beginning of June, at which time also leaves are present. Later in summer those leaves fall and in August the plant has only a very few leaves left. The new leaves develop at the top of the twigs in the end of August and the beginning of September at the same time as the new flowers, and at the end of September the plant is ready for next years flowering, with large buds and comparatively developed leaves. In this state it is covered by the snow and kept unchanged until next spring, when the buds burst as soon as the snow melts. The leaves, however, are not fully developed when the plants starts flowering, but increase considerably in size during June and July. The flowers are yellowish white.

Our plant is related to *D. pseudo-mezerum* A. Gray (from which it differs in having smaller flowers, narrower inner perigon leaves, the perigon leaves shorter compared with the tube and in enclosed stamens) and to *D. iezoensis* Maxim. (from which it differs in having smaller flowers, acute leaves, enclosed stamens, and in having the ovary of about the same length as the stamens), both occurring in Japan. (Compare Maxim. in Regel loc. cit.).

Type of distribution: Asiatic Pacific.

Geographical area: Kamtchatka Penins., Saghalin, Ussuri, Kirin prov. and northern Corea.

Onagraceae Lindl.

Epilobium.

By G. Samuelsson.

569. ***Epilobium anagallidifolium*** Lam., Dict. encycl. II (1786) p. 376. Kom., Voy. Kamtch. p. 212.

South Kamtchatka: Kurile Lake Aug. 27th 1922 Hn No. 4431; Illina volcano 600 m. Aug. 23rd 1922 Hn No. 4393; middle Kidipalok R. Sept. 5th 1922 Hn No. 4503; middle Ksudach R. Aug. 6th 1921 Hn No. 2722 a; Assatcha mts. 600 m. Aug. 10th 1922 Hn No. 4199; Akhomten Bay 250 m. Sept. 9th 1920 Hn No. 1220; Shirovaja Bay Aug. 15th 1920 Hn No. 1488 (Novograblenof); the Shalsan Pass Aug. 27th 1908 Komarov (sub *E. anagallidifolium, E. sertulatum* and *E. sertulatum* × *Hornemanni*).

East Kamtchatka: Avatcha volcano 675 m. Aug. 4th 1920 Hn No. 739; the Kronoki Pass Aug. 6th 1909 Komarov (sub *E. sertulatum* Hb. Berol.); Klutchevskaja volcano June 5th 1927 Malaise No. 123.

Central Kamtchatka: Sources of Kashkan R. Komarov 1909 (Hb. Holm.).

It may be worth mentioning that most of the Kamtchatka specimens of this species are white-flowered, which is not the case in, for instance, Scandinavian material.

Type of distribution: Circumpolar, arctic-alpine.

Geographical area: Europe: from Iceland, northernmost Scandinavia and the northern Urals southwards in the mts. to Spain, Italy and Greece, also in Caucasus. Asia: known from Taimyr Penins., Chukch Penins., Asia Minor, Altai Sajan Mts., Transbaikalia and Kamtchatka. America: Alaska to Labrador southwards in the mts. to California, Colorado and E. Quebec. E. and W. Greenland.

570. ***Epilobium angustifolium*** L., Sp. pl. ed. I (1753) p. 347 (*angustifolia*).

Krascheninn., Kamtsch. p. 106; Steller in Pallas, Neue Nord. Beytr. II p. 301; Mertens, Bemerk. Fl. Koragins p. 63; Ledeb., Fl. Ross. II p. 105; Kittlitz, Denkw. II pp. 238, 303; Ditmar, Reisen I pp. 108, 371, Reisen II pp. 85, 103; Haussk., Monogr. Epilob. p. 37; Yabe & Yendo, Fl. Shimushu p. (188); Fedtsch., Fl. Îl. Comm. p. 57; Koidz. Pl. Yokoyam. p. 214; Kom., Voy. Kamtch. p. 452; Kudo, Fl. Paramush p. 133. — *Chamaenerium speciosum* Pallas in Stralsund. Mag. II (1768) p. 176 and V (1769) p. 429. — »*Epilobium*» Ditmar, Reisen I pp. 297, 396, 422, 447, 552, 578, 687.

Northern Kuriles: Paramushir Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Kurile Lake noted by Hn; lower Ozernaja R. noted in A. 96; Ozernaja village noted by Hn; between Javina and Golygina noted by Hn; between Kochegochek and the mouth of Golygina R. common noted by Hn; the junction of Golygina and Ksudach rivers noted in A. 89; upper Ksudach R. noted in A. 83; uppermost Ksudach R. in meadow noted by Hn; the western Shadutka R. in meadow noted by Hn; the volcanic desert at Shadutka partly forming the chief vegetation on the volcanic ashes, also in the *Salix*-thickets along the rivers, noted by Hn; Lake Sterbot noted in A. 215, A. 216; upper Savan R. noted in A. 79; between Lake Sterbot and Lake Kambolnoje along the shore common, noted by Hn; NW. slope of Assatcha mts. in *Betula platyphylla* meadow noted by Hn; upper Opala R. near Assatcha noted in A. 183, A. 184, A. 185; Lake Kambolnoje noted by Hn; Zykovaja noted in A. 217; the hot springs at Opala R. noted in A. 180, A. 182; Akhomten Bay noted in A. 25, A. 30; NW. of Opala volcano noted in A. 67, A. 68, A. 69; upper Abshen R. noted in *Betula* forest; lower Bolshaja R. noted in A. 105; the junction of Tolmachovaja rivers noted in A. 157; middle Karymchina R. noted in meadow and *Angelica* meadow by Hn; lower Karymchina R. noted in A. 124, A. 151; near the mouth of Balaganchik R. noted in A. 152, A. 153, A. 154; lower Danilina R. noted in A. 61; near the mouth of Ipelka R. noted in A. 57, A. 60; Agashka R. noted in A. 62, A. 63, A. 64; the Kohelok Pass 650 m. noted by Hn; S. E. of Bolsheredsk noted in A. 56; Bolsheredsk noted by Hn; between Bolsheredsk and Apatcha noted in A. 113; the hot springs at Siku R. noted in A. 122 and in meadow and *Angelica* meadow; Apatcha noted by Hn; lower Bannaja R. noted by Hn; upper (Paratunka-) Bystraja R. noted in A. 128; Paratunka Stubendorff 1849; Mt. Zerkalo, Natchika noted in A. 114, A. 115, A. 118, A. 119; between Natchika and Korjaka acc. to Ditmar loc. cit. p. 447; lower Avatcha R. acc. to Ditmar loc. cit. p. 687.

East Kamtchatka: Petropavlovsk MERTENS, do. DOBROTVORSKY 1888, do. GUDZENKO 1900, do. Aug. 16th 1920 HN No. 886; between Petropavlovsk and Avatcha volcano noted in A. 7, A. 9, A. 17, A. 18, A. 23, A. 24 a, A. 42, A. 43, do. growing in abandoned ant-hills noted by HN; Nalutcheva PERFILJEV 1910; Semjatchik acc. to DITMAR loc. cit.; Uzon acc. to KOM. loc. cit.; the Kronoki Pass KOMAROV 1909; Ustj-Kamtchatsk Aug.—Sept. 1925 MALAISE (var. *intermedium*).

Commander Islands: Bering Island acc. to STELLER loc. cit., do. GREBNITZKY and acc. to FEDTSCH. loc. cit. MOROZEVICZ.

Central Kamtchatka: Malka STUBENDORFF 1849; between Sharomsk and Vershne Kamtchatsk acc. to DITMAR loc. cit. p. 422; Milkova KOMAROV 1909; Shtchapina GRINOP 1909, do. KOMAROV 1909; Tolbatchik acc. to DITMAR loc. cit. p. 396; Klutchi acc. to DITMAR loc. cit. p. 371, do. AFANASEJEV 1909; lake Kurarotchnoje BEZAIS 1909.

West and North Kamtchatka: Utka RUBINSKI 1908; Tigil LEVITZKY 1848, do. GUDZENKO 1910; Kachtana acc. to DITMAR loc. cit. p. 578; Uka YOKOYAMA (Hb. Sapporo); Pallan SAVTCHENKO 1911; Karaga YOKOYAMA (Hb. Sapporo); Karaginsk Island acc. to MERTENS loc. cit., do. LOGINOVSKI 1910.

»Kamtchatka»: KUSMISCHEFF (sub *E. spicatum* v. *macrophyllum*), PETERS (sub *E. spicatum* v. *macrophyllum*).

Noted in the following associations:

In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 7, A. 9, A. 17, A. 18, A. 23, A. 42, A. 43); Scattered (A. 183).

In *Betula Ermani—Filipendula—Dryopteris* ass.:
Single (A. 180); Sparse (A. 24 a, A. 30); Scattered (A. 62, A. 63, A. 64, A. 115).

In *Betula Ermani—Filipendula—Equisetum hiemale* ass.:
Single (A. 57); Scattered (A. 89).

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 67, A. 68, A. 69, A. 79, A. 83, A. 96, A. 105, A. 185); Sparse (A. 153); Scattered (A. 114, A. 119, A. 184); Abundant (A. 182).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 61, A. 113); Sparse (A. 56, A. 151); Scattered (A. 122, A. 124).

In *Betula platyphylla—Thalictrum—Carex* ass.:
Sparse (A. 154); Scattered (A. 152, A. 157).

In *Carex—Sanguisorba*—Moss ass.:
Single (A. 60).

In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Single (A. 25, A. 215, A. 216, A. 217).

In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Single (A. 118).
In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 38, A. 128).

In South Kamtchatka *E. angustifolium* is very common in all *Betula* forests and meadows of the lowlands, also occurring, although more rarely, in the lower alpine region.

The specimen collected by Malaise at Ustj Kamtchatsk closely resembles Greenland specimens belonging to var. *intermedium* (Wormskj.) Fern.

The Kamtchatka name of the plant is »kiprei». The marrow of the stems was formerly much used for food.

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland, northernmost Scandinavia and arctic Russia southwards to the Mediterranean Sea. Asia: at Yenisei and Lena at least at about 70° N. lat. and from Chukch Penins. southwards to Asia Minor, Syria, northern Persia, Western Himalaya, Tibet, Sze-ch'uan, Corea and Honshu. America: from the north coast of Alaska to Baffin Land and Labrador, southwards to California, New Mexico, Illinois and N. Carolina. W. Greenland (N. to Disco), E. Greenland (to Angmagsalik). Also in Madeira and the Canary Islands.

571. ***Epilobium Behringianum*** Haussk., Monogr. Epilobium (1884) p. 277.

Fedtsch., Fl. Îl. Comm. p. 58 saltem pro parte; Kudo, Fl. Paramush. p. 135. — ?*Epilobium ovale* Kudo, Fl. Paramush. p. 135.

Northern Kuriles: ? Paramushir C. Taro 1892 acc. to Kudo loc. cit., Kudo 1920 acc. to Kudo loc. cit.

East Kamtchatka: Petropavlovsk July 19th 1920 Hn No. 503 b, do July 10th 1928 W. Eyerdam.

Commander Islands: Bering Island Kjellman and acc. to Fedtsch. loc. cit. Dybovsky and Morozevicz; Copper Island Aug. 26th 1921 Sandberg (Hb. Holm.) and acc. to Fedtsch. loc. cit. Dobrotvorsky and Dybovsky.

»Kamtchatka»: Mertens acc. to Haussk. loc. cit.

Type of distribution: ? Northern Pacific.

Geographical area: Asia: Commander Islands, southern Kamtchatka, the Kuriles south to Urup. America: acc. to Haussk. the Aleutian Islands, Kodiak Island and Sitka. Reported by Fernald also from Eastern America (in Newfoundland, comp. Rhodora 28, 1926 p. 219).

572. ***Epilobium davuricum*** Fischer in Hornem., Suppl. hort. bot. Hafn. (1819) p. 44.

Haussk. Monogr. Epilob. p. 145. — *Epilobium palustre* var. *albescens* Erman, Verzeichn. p. 63 (fide Haussk.); Ledeb., Fl. Ross. II p. 109 quoad pl. Kamtsch.

South Kamtchatka: Povorotnaja (= Mutnovskaja) volcano 1600 feet Rieder in Erman loc. cit. (acc. to Haussk. loc. cit.); the hot springs at Bannaja R. Aug. 2nd 1924 P. T. Novograblenof No. 628 (Hb. Holm.).

Type of distribution: ?Circumpolar.

Geographical area: Europe: from northernmost Scandinavia, Kola Penins. and Vaigatch southwards to central Scandinavia. Asia: along the North Coast to Kolyma (and probably to Chukch Penins.), also in southern Yenisei prov., Irkutsk prov., Transbaikalia and Kamtchatka. America: known from Alaska (Kotzebue Sound) to Washington (acc. to Haussk.), and from W. Newfoundland and Anticosti.

573. ***Epilobium glandulosum*** Lehm., Pug. II (1830) p. 14.

Haussk., Monogr. Epilob. p. 273; Fedtsch., Fl. Îl. Comm. p. 58; Kudo Fl. Paramush. p. 134. — »*Epilobium subalgidum* Haussk.?» Yabe & Yendo, Fl. Shimushu p. (188). — *Epilobium kurilense* Nakai, Bot. Mag. Tokyo XXII (1908) p. 83.

Northern Kuriles: Paramushir Kudo 1920 acc. to Kudo loc. cit.; Shumshu acc. to Yabe & Yendo and Nakai loc. cit.

South Kamtchatka: Cape Lopatka Bjeloussof 1914; Kurile Lake Aug. 28th 1922 Hn No. 4410; upper Unkanakchek R. Aug. 19th 1922 Hn No. 4318; upper Ksudach R. Aug. 5th 1921 Hn No. 2664 a; middle Ksudach R. Aug. 6th 1921 Hn No. 2722 b; the hot spring at Shadutka R. Aug. 12th 1922 Hn No. 4243; the hot spring at Savan R. 110 m. July 31st 1921 Hn No. 2517; Assatcha mts. 300 m. Aug. 8th 1922 Hn No. 4167 and 4168; Listvenichnaja Bay Rieder acc. to Haussk. loc. cit.; the hot spring at upper Opala R. Aug. 2nd 1922 Hn No. 4117; the hot springs at upper Karymchina R. 400 m. Sept. 10th 1921 Hn No. 3101; 10 km. W. of Bolsheredsk Aug. 26th 1921 Hn No. 2971; the hot springs at Siku R. Sept. 5th 1921 Hn No. 3045; the hot spring »Malenki klutchik» Bannaja 375 m. Sept. 12th 1921 Hn No. 3152 a; the hot springs at upper Bannaja R. 440 m. Sept. 12th 1921 Hn No. 3204 a; Toporkoff Island, Sarannaja Bay Aug. 8th 1920 Hn No. 792; the hot springs at Natchika Komarov 1908, do. 340 m. Sept 2nd 1921 Hn No. 2993; »Avatcha Bay» Seemann acc. to Haussk. loc. cit.

East Kamtchatka: Petropavlovsk Mertens acc. to Haussk. loc. cit., do. July 19th 1920 Hn No. 503 a, do. July 21st 1920 Hn No. 539 a and 539 b, do. July 23rd 1920 Hn No. 565; Uzon crater Komarov 1909.

Commander Islands: Bering Island Stejneger acc. to Fedtsch. loc. cit.

Central Kamtchatka: Malka Stewart and Peters acc. to. Haussk. loc. cit.; Shtchapina July 23rd 1921 Hn No. 3477 a (Malaise); Anauna R. Aug. 21st 1926 Malaise No. 145; Klutchi Bezais 1908 (Hb. Holm.).

West and North Kamtchatka: Tigil Rieder acc. to Haussk. loc. cit.

»Kamtchatka»: Rastargujef, Kastalsky, Kusmischeff, »in sinu Tahkitsch Rieder (the place is unknown to me = Ktakiek?) all acc. to Haussk. loc. cit.

Our species is certainly an American type represented in North America by a multitude of forms, the value of which is not yet clear. It is here taken in the wide sense, as it is, for instance by FERNALD. Further, the Kamtchatka-material enumerated above is not quite uniform. At least two different forms are present, one of which is represented by some specimens from Petropavlovsk (Nos. 503, 565, 593 b).

Most of the material agrees, as far as one can judge from the original description and from the illustration in LÉVEILLÉ, Iconogr. Epilob. tab. CXXX, with *E. kurilense* NAKAI.

Type of distribution: American, transgressing into Eastern Asia.

Geographical area: Asia: the mouth of Amur R., Saghalin, Kamtchatka, Yezo and Honshu. America: (acc. to FERNALD 1925) from Alaska 55° N. lat. to Oregon 42° N. lat. (acc. to RYDB. eastwards to Saskatchewan and Wyoming), and from Labrador 52° N. lat. to Gaspé Penins. and Magdalen Isl. Not in the region around the Great Lakes.

574. ***Epilobium Hornemanni*** REICHB., Ic. Crit. II (1824) p. 73 tab. 180 f. 313.

HAUSSKN., Monogr. Epilob. p. 174 (also forma a. *minor*).

South Kamtchatka: Akhomten Bay Aug. 30th 1920 HN No. 1161 (MALAISE).

»Kamtchatka»: STEWART, KASTALSKY, KUSMISCHEFF, PETERS, RIEDER all acc. to HAUSSKN. loc. cit.

The strongly papillose seeds of the above-mentioned specimen from Akhomten Bay establishes it as true *E. Hornemanni*.

Our species is also reported by KUDO (Fl. Paramush. p. 135) as having been collected in several places in Paramushir Island. Probably most of those specimens belong to *E. sertulatum*. Compare under that species.

Type of distribution: ?Circumpolar.

Geographical area: Europe: from Iceland, northernmost Scandinavia and Kola Penins. southwards to central Scandinavia and Finland, also in the northern Urals (N. Perm. prov.). Asia: only known from »Judoma crest» (between Jakutsk and Ochotsk) and Kamtchatka; also reported from the southern Kuriles, Yezo and Honshu, but such reports need confirmation as they may refer to the very similar *E. sertulatum*. America: from the Aleutian Islands and Yukon (62° N. lat.) to Labrador 58° N. lat., southwards to California (38° N. lat.), Colorado and New Hampshire (44° N. lat.). W. and E. Greenland to about 70° N. lat.

575. ***Epilobium latifolium*** L., Sp. pl. ed. I (1753) p. 347 (*latifolia*).

PENNANT, Arct. Zool. (1784) p. CXV; GEORGI, Beschreib. III: 4 p. 927; CHAM. & SCHLECHT. in Linnaea II (1827) p. 552; MERTENS, Bemerk. fl. Koragins p. 64; ERMAN, Verzeichn. p. 63; LEDEB., Fl. Ross. II p. 106; KITTLITZ, Denkw. II pp. 256, 333; HAUSSKN., Monogr. Epilob. pp. 190, 191 (»*A. canescens β Kamtschatica*»), 192 (»*B. glabrescens δ venosa*»); FEDTSCH., Fl. Îl. Comm. p. 57; KUDO, Fl. Para-

mush. p. 133 (var. *arcticum*). — »*Epilobium foliis alternatis lanceolato-ovatis*» GMEL., Fl. Sib. III p. 164. — *Epilobium Kamtschaticum* LEPECHIN in Nov. Acta Ac. Sc. Petropol. XI (1793) p. 370, tab. VI; GEORGI, Beschreib. III: 4 p. 929 (*camtschaticum*); YABE & YENDO, Fl. Shimushu p. (188).

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.; cultivated from seeds collected on the Kuriles by LAXMANN junior acc. to LEPECHIN loc. cit.

South Kamtchatka: N. W. of Kurile Lake 525 m. noted by HN; upper Unkanakchek R. 230 m. noted by HN; Golygina R. 60 verst from the mouth at »Solotoj jarr» RUBINSKI 1909; middle Ksudach R. Aug. 6th 1921 HN No. 2712; the northern slope of Assatcha Mts. noted by HN; Assatcha Mts. 600 m. Aug. 10th 1922 HN No. 4192; upper Opala R. near Assatcha noted by HN; Lake Tolmachovaja noted by HN; the Kohelok Mt. 640 m. noted by HN; Bolsheredsk noted by HN; the hot springs at Bannaja RUBINSKI 1909; Paratunka KOMAROV 1908; Nikolajevsk KOMAROV 1908; Uzdets R. 550 m. noted by HN; Korjaka village KOMAROV 1908; »Avatcha Bay» Hb. Kew acc. to HAUSSKN. loc. cit.

East Kamtchatka: Avatcha volcano 675 m. Aug. 4th 1920 HN No. 743; Ustj Kamtchatsk July 15th—30th 1925 MALAISE; Shivelutch 3000 feet KOZLOVSKI 1910.

Commander Islands: Bering Island STEJNEGER acc. to FEDTSCH. loc. cit.; Copper Island MOROZEVICZ acc. to FEDTSCH. loc. cit.

Central Kamtchatka: Vaktal R., Ganala PROTOPOPOF 1908; Sharomsk KOMAROV 1909; between Shtchapina and the Kronoki Pass KOMAROV 1909; Kunchekla GRINOP 1909.

West and North Kamtchatka: Utka RUBINSKI 1908; Itchinsk BJELOUSSOF 1914; between Tigil and Sedanka BEZAIS 1909; between Sedanka and Jelovka BEZAIS 1909; Karaginsk Island acc. to MERTENS loc. cit., do. LOGINOVSKI 1910, do. July 23rd 1920 SKOBUNOFF.

»Kamtchatka»: STELLER and KRASCHENINNIKOF acc. to GMEL. loc. cit., STEWART, KUSMISCHEFF, PETERS, RIEDER all acc. to HAUSSKN. loc. cit.

In South Kamtchatka *E. latifolium* occurs here and there in the lowlands (chiefly var. *kamtschaticum*) and in the lower alpine region (chiefly var. *arcticum*) up to an altitude of about 700 m. It has been assumed that a hybrid between our species and *E. angustifolium* exists. FERNALD opposes this view in Rhodora 20 (1918) p. 6—10, where he comes to the conclusion that the hybrid in question does not exist. During my journeys in South Kamtchatka, where both species are common, I never observed any plant that gave the impression of being a hybrid. *E. angustifolium* is a plant of the meadows, where it occurs in masses all over the area, while *E. latifolium*, which occurs more scattered, is invariably a decumbent plant of the gravel on the river banks. Further, my examination of the herbarium material has not revented any traces of a hybrid between those species.

For morphological differences between them see FERNALD loc. cit.

Type of distribution: ?

Geographical area: Europe: Only known from Iceland, Nova Zembla and the adjacent part of arctic Russia. Asia: along the North Coast to Chukch Penins., southwards at Yenisei to about 68° 30′ N. lat., to Vilju distr., Lake Baikal, mts. of Amur Prov., Ajan and Urup; also in Sajan Mts., S. and E. Altai, mts. of Turkestan, Kashmir, northern Mongolia and (?) Ussuri. America: from the north coast of Alaska to Ellesmereland, Baffin Land, Labrador and Newfoundland, southwards to British Columbia, in the Rocky Mts. to Colorado, to Hudson Bay and Gaspé Penins. E., W. and N. Greenland. A map of the distribution is given by FERNALD in Mem. Gray. Herb. II (1925) p. 337.

576. ***Epilobium palustre*** L., Sp. pl. ed. I (1753) p. 348.

HAUSSKN., Monogr. Epilob. p. 133 (*η lavandulaefolium*, *ϑ adenophorum*); YABE & YENDO, Fl. Shimushu p. (188); KUDO, Fl. Paramush. p. 134.

Northern Kuriles: Paramushir KUDO 1920 acc. to KUDO loc. cit.; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Lower Ozernaja R. Aug. 12th 1921 HN No. 2818; the hot springs at upper Unkanakchek R. Aug. 19th 1922 HN No. 4317; the divide between Shadutka and Ksudach rivers Aug. 4th 1921 HN No. 2622; middle Assatcha R. Aug. 11th 1922 HN No. 4211; Topik 150 m. July 27th 1921 HN No. 2462; between Opala and Savan rivers 150 m. July 27th 1921 HN No. 2463; Assatcha mts. 300 m. Aug. 8th 1922 HN No. 4170; Tikhirka Bay RIEDER 1833; the hot spring »Malenki klutchik» Bannaja Sept. 12th 1921 HN No. 3152 b; the hot springs at Bannaja 440 m. Sept. 12th 1921 HN No. 3204 b, do. Aug. 2nd 1924 P. T. NOVOGRABLENOF No. 629 (Hb. Holm); Bogatyrjovka July 16th 1920 HN No. 471; Lake Natchika KOMAROV 1908; the hot spring at Natchika KOMAROV 1908; Korjaka village KOMAROV 1908.

East Kamtchatka: Petropavlovsk July 23rd 1920 HN No. 564; 6 km. E. of Petropavlovsk Aug. 14th 1923 P. T. NOVOGRABLENOF; Nalutcheva PERFILJEF 1910; Kishpinitch volcano KOMAROV 1909; Uzon KOMAROV 1909; Lake Kronoki KOMAROV 1909.

Central Kamtchatka: Ganala KOMAROV 1909; between Pushtchina and Sharomsk KOMAROV 1909; Kirganik KOMAROV 1909 (sub *E. dahuricum* Hb. Holm.); Shtchapina KOMAROV 1909 (Hb. Holm.); Tolbatchik KOMAROV 1909.

West and North Kamtchatka: Tigil ERMAN acc. to HAUSSKN. loc. cit., do. LEVITZKY; Karaginsk Island MERTENS.

»Kamtchatka» STUBENDORFF acc. to HAUSSKN. loc. cit.

In South Kamtchatka *E. palustre* is fairly common. It flowers in July and August.

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland, northernmost Scandinavia and the northern Urals southwards to the Mediterranean Sea. Asia: from the

mouth of the Yenisei R. and lower Lena R. southwards to Asia Minor, northern Persia, Western Himalaya, Sze-ch'uan, Corea and Yezo. America: from Alaska to Labrador and Newfoundland, southwards to Lake Superior and New England. W. Greenland (to Disco). In W. America the closely related *E. wyomingense* Nels., southwards to Utah and Colorado.

577. ***Epilobium sertulatum*** Hausskn. in Österr. Bot. Zeitschr. 29 (1879) p. 52.

Hausskn., Monogr. Epilob. p. 220 tab. IV fig. 43 a, b.

South Kamtchatka: Lower Ozernaja R. Aug. 12th 1921 Hn No. 2805; middle Kidipalok R. Sept. 5th 1922 Hn No. 4570; lower Ksudach R. Aug. 5th 1921 Hn No. 2664 b; between Opala and Savan R. 150 m. July 27th 1921 Hn No. 2463; Assatcha mts. 400 m. Aug. 8th 1920 Hn No. 4169 (possibly a hybrid with *E. anagallidifolium*); Mutnaja Bay Rieder 1831 (Hb. Hausskn., type of the species); Akhomten Bay 250 m. Sept. 9th 1920 Hn No. 1220 b, do. Sept. 21st 1920 Hn No. 1427; Opala volcano 300 m. July 30th 1921 Hn No. 2239; Bolsheredsk July 10th 1921 Hn N. 2106; Toporkoff Island Aug. 8th 1920 Hn No. 792; the Shalsan Pass 700 m. Sept. 1st 1921 Hn No. 2988 b; Natchika Komarov 1908 (sub *E. Bongardi*); between Natchika and Korjaka Komarov 1908 (sub *E. Behringianum*); Korjaka Komarov 1908 (sub *E. lactiflorum*).

East Kamtchatka: Avatcha volcano Aug. 25th 1928 W. Eyerdam; slopes of Kishpinitch volcano Sept. 4th 1909 Komarov (sub *E. Hornemanni* Hb. Holm.).

Central Kamtchatka: Anauna R. Aug. 21st 1926 Malaise No. 146.

The type of *E. sertulatum* in Hb. Haussknecht consists only of small specimens of the plant, which is here entered under that name and which is very common in Kamtchatka. As to the habitus of our species, it almost exactly matches *E. Hornemanni* Rchb., also showing about the same variations as that species, from which, however, it differs distinctly in its smooth seeds. Specimens without ripe seeds can hardly be reliably determined. Such specimens, however, that probably belong to our species are:

South Kamtchatka: Middle Kidipalok R. Sept. 5th 1922 Hn No. 4502; Akhomten Bay Sept. 22nd .1920 Hn No. 1459; Bolsheredsk July 8th 1921 Hn No. 2021; Savoiko Komarov 1909 (sub *E. Hornemanni*); Poperochnaja R. Komarov 1909 (sub *E. Hornemanni*); Korjaka Komarov 1908 (sub *E. Behringianum*).

Probably specimens belonging to the series of *E. sertulatum* were also referred by Haussknecht and others to *E. Behringianum* Hausskn., *E. Bongardi* Hausskn. and *E. lactiflorum* Hausskn. Without access to the specimens on which those quotations are based it is impossible to pass an opinion on this question. Among specimens of *E. Bongardi* in Hb. Hausskn., and under that name there is one individual collected, acc. to the label, in Sitcha by Postels, which completely agrees with Kamtchatka specimens of our species,

but differs from the other specimens of *E. Bongardi* in having broader leaves with less prolonged apex, less distinct petioles etc. Until evidence is forthcoming it must be regarded as doubtful whether that specimen really originates from the locality given in the label.

E. Bongardi is on the whole a somewhat unclear species.

Type of distribution: ? Northern Pacific.

Geographical area: The species is with certainty known only from our area, and as it has apparently been confused with several other species its distribution must be regarded as unknown for the present.

Besides the species treated above, some others are reported from our area which, without access to the corresponding specimens, it is not possible to place. These reports are:

Epilobium Amurense HAUSSKN., Monogr. Epilob. p. 203.

KOM. in Acta Horti Petrop. XXV (1905) p. 92.

»Kamtchatka»: STEWART.

The report of this species from Kamtchatka needs confirmation.

Epilobium Bongardi HAUSSKN. in Österr. Bot. Zeitschr. 29 (1879) p. 57.

HAUSSKN., Monogr. Epilob. p. 278; FEDTSCH., Fl. Îl. Comm. p. 58; KUDO, Fl. Paramush. p. 135.

Northern Kuriles: Paramushir C. TARO 1892, KUDO 1920 both acc. to KUDO loc. cit.

South Kamtchatka: Utashut island RIEDER acc. to HAUSSKN. loc. cit.

Commander Islands: Bering Island acc. to FEDTSCH. loc. cit.

»Kamtchatka»: MERTENS acc. to HAUSSKN. loc. cit.

It seems doubtful whether this plant is present within our area or not. Compare under *E. sertulatum*.

Epilobium lactiflorum HAUSSKN. in Österr. Bot. Zeitschr. 29 (1879) p. 89.

HAUSSKN., Monogr. Epilob. p. 158 (e. *fontana*, f. *Kamtschatica*, g. *Riederiana*); FEDTSCH., Fl. Îl. Comm. p. 58; KUDO, Fl. Paramush. p. 134.

Northern Kuriles: Paramushir KUDO 1920 acc. to KUDO loc. cit.

South Kamtchatka: »in sinu Rukanitschkin (= Rukavitchkin Bay) et Sarannaja» RIEDER acc. to HAUSSKN. loc. cit.

Commander Islands: Bering Island GREBNITZKY acc. to FEDTSCH. loc. cit.

»Kamtchatka»: STEWART (= WRANGEL?), PETERS, »Petropavlovsk» MERTENS, all acc. to HAUSSKN. loc. cit.

As HAUSSKNECHT himself referred all Kamtchatka-specimens to special forms, and as the species is not present in collections seen by me, its presence within our area seems to be in need of further confirmation. Compare under *E. sertulatum*.

578. ***Circaea alpina*** L., Sp. pl. ed. I (1753) p. 9.

YABE & YENDO, Fl. Shimushu p. (189); KUDO, Fl. Paramush. p. 136.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: N. of Kurile Lake noted by HN; near Sahach noted by HN; Golygina village Aug. 7th 1921 HN No. 2745; the hot springs at upper Opala R. in *Alnus* thickets noted by HN; lower Artemjeva noted by HN; below Paratunka village KOMAROV 1908; Bogatyrjovka July 16th 1920 HN No. 456, do. Aug. 6th 1920 HN No. 472 (MALAISE); Mt. »Seloni gor» (Lake Natchika) RAMENSKI 1908; Poperochnaja R. KOMAROV 1908; the Korjaka valley KOMAROV 1908.

East Kamtchatka: Lake Assabatch Aug. 15th 1925 MALAISE No. 490.

Central Kamtchatka: Shtchapina July 23rd 1921 HN No. 3477 b (MALAISE).

In South Kamtchatka this species was only seen in the above-enumerated places. It flowers at the end of July and in August.

Type of distribution: Circumpolar.

Geographical area: Europe: from northern Sweden, central Finland and Russia southwards to the Pyrenees, Italy, Crimea and Caucasus. Asia: from 60° N. lat. southwards to Asia Minor, Sze-ch'uan, Corea and southern Japan, in the Himalayas and China var. *imaicola* ASCHERS. & MAGN. America: from Alaska to Labrador, southwards to Colorado, South Dakota, Indiana and Georgia.

Halorrhagidaceae LINDL.

579. ***Myriophyllum isoetophilum*** KOMAROV in FEDDE, Rep. Spec. Nov. XIII (1914) p. 168.

East Kamtchatka: Sheljesnoj R. at Lake Ovalni KOMAROV 1908.

This peculiar little plant is hitherto only known from the type collection of KOMAROV. Unfortunately only staminate flowers are present and it is therefore impossible to determine with certainty in which section of the genus it should be placed. In the details it reminds one of small forms of *M. ussuriense* MAXIM. More material of the plant is needed.

Type of distribution: ?

Geographical area: So far only known from the type locality.

580. ***Myriophyllum spicatum*** L., Sp. pl. ed. I (1753) p. 992.

Myriophyllum alterniflorum KJELLM., Komm. Faner. Fl. p. 298; FEDTSCH., Fl. Îl. Comm. p. 59. — *Myriophyllum verticillatum* KOM., Voy. Kamtch. p. 456. — »*Myriophyllum*» KOM., Voy. Kamtch. p. 387. — *Myriophyllum sibiricum* KOMAROV in FEDDE, Rep. Spec. Nov. XIII (1914) p. 168.

South Kamtchatka: N. of the mouth of Opala R. Aug. 16th 1921 HN No. 2883, do. Sept. 11th 1922 HN No. 4565; Lake Koshkovatoje, Schlamovitka R. (Avatcha) RAMENSKI 1908.

East Kamtchatka: Lake Nalutcheva KOMAROV 1909, do. PERFILJEF 1910; Uzon crater, the central lake KOMAROV 1909, do. SAVITCH 1909; Lake Kronoki KOMAROV 1909.

Commander Islands: Bering Island KJELLMAN; Copper Island STEJNEGER acc. to FEDTSCH. loc. cit.

Central Kamtchatka: Mashura KOMAROV 1909; middle Tolbatchik R. BEZAIS 1908.

»Kamtchatka»: KUSMISCHEFF, »Petropavlovsk» (= Petrop. district) MERTENS.

Of the material enumerated above only some few (such as the spec. from Tolbatchik, the spec. of MERTENS) are well developed with fruits or flowers. All the others are sterile and can thus hardly be definitely determined, but there is nothing to show that they should belong to *M. verticillatum* or any species other than *M. spicatum*. The specimen of KJELLMAN from Bering Island reported as *M. alterniflorum* is sterile but differs in no way from the other material. *M. alterniflorum* is an »Atlantic» species not known with certainty from the Pacific region.

From material of our plant collected in Kamtchatka KOMAROV described a new species *M. sibiricum*, which he thinks might possibly be a subspecies of *M. verticillatum*. It is very difficult to understand this, as his specimens have a dense short spike with floral leaves dentate and shorter than the flowers. As in Scandinavia and other parts of Europe *M. spicatum* very often has tuberculate carpels exactly resembling those of the Kamtchatka plant, *M. sibiricum* KOM. is to be regarded as a synonym of *M. spicatum* f. *muricatum* NEUM.

Type of distribution: Cosmopolite.

Geographical area: Europe: from Iceland, northern Sweden, central Finland and northern Russia southwards. Asia: at Yenisei from about 70° N. lat. and from Vilju distr. southwards to Asia Minor, India, China and Formosa. America: from Alaska to Newfoundland, southwards to southern California, New Mexico, the Great Lakes and Connecticut. W. Greenland. Also in S. America, N. and S. Africa and Australia.

581. ***Hippuris tetraphylla*** L. fil. in Suppl. plant. syst. veg. (1781) p. 81.

FEDTSCH., Fl. Îl. Comm. p. 59.

East Kamtchatka: the »koshka» at the mouth of Avatcha R. KOMAROV 1908; near the mouth of Jurtochnoj R. KOMAROV 1909.

Commander Islands: Bering Island STEJNEGER acc. to FEDTSCH. loc. cit.

»Kamtchatka»: »Com. BUNGE» (Hb. Acad. Petrop.).

Concerning the identity of the species cf. LINDBERG in Meddel. Soc. Fauna et Flora Fenn. 31 (1906) p. 108.

Type of distribution: ? Circumpolar.

Geographical area: Europe: northernmost Norway, Kola Penins., Kanin, Aland and W. and S. shores of Finland. Asia: known from Kolyma distr. and Chukch Penins.(!) southwards to Ajan(!), Udskoj distr.(!). Saghalin, E. Kamtchatka and Commander Islands. In N. America »*H. vulgaris* v. *maritima*» acc. to FERNALD (1925 p. 271) is reported from Alaska 70° N. lat. to Labrador 60° N. lat., southwards to Alaska 55° N. lat. and Gaspé Penins. Whether these reports should be referred to our plant, to *H. vulgaris* f. *litoralis* LINDB. (loc. cit. p. 109) or to both is unknown to me. I have, however, seen a specimen from Port Clarence belonging to *H. tetraphylla*. What I have seen from Greenland does not belong to our species.

582. ***Hippuris vulgaris*** L., Sp. pl. ed. I (1753) p. 4.

MERTENS, Bemerk. Fl. Koragins p. 65; LEDEB., Fl. Ross. II p. 119; FEDTSCH., Fl. Îl. Comm. p. 59; YABE & YENDO, Fl. Shimushu p. (188); KOM., Voy. Kamtch. pp. 226, 452; KUDO, Fl. Paramush. p. 136. — »*Hippuris* . . . . .» GMEL., Fl. Sib. III p. 7.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Lower Ozernaja R. noted by HN; Javina village noted by HN; Golygina village noted by HN; upper Ksudach R. noted by HN; Akhomten Bay Sept. 12th 1920 HN No. 1332; near the mouth of Bolshaja R. July 4th 1921 HN No. 1944; Bolsheredsk noted by HN; Apatcha noted by HN; Malochni klutch R., Paratunka KOMAROV 1908; the hot springs at Paratunka village June 17th 1921 HN No. 1762; Nikolajevsk Aug. 11th 1920 HN No. 847; Uzdetz R. noted by HN; above Natchika village KOMAROV 1908; Savoiko KOMAROV 1908.

East Kamtchatka: »Petropavlovsk» MERTENS; Nalutcheva PERFILJEF 1910; S. of the mouth of Haliger R. KOMAROV 1909; Lake Kronoki KOMAROV 1909; Ustj-Kamtchatsk PROTOPOPOF 1909.

Commander Islands: Bering Island DYBOVSKY 1879, GUDZENKO 1910.

Central Kamtchatka: Between Milkova and Kirganik acc. to KOM. loc. cit.; Mashura KOMAROV 1909; Klutchi BEZAIS 1908 (Hb. Berol.).

West and North Kamtchatka: Karaginsk Island MERTENS, do. GUDZENKO.

»Kamtchatka»: STEWART, RIEDER, DYBOVSKY 1879.

Type of distribution: Circumpolar, also in the southern hemisphere.

Geographical area: Europe: from Iceland, Bear Island, northernmost Scandinavia and Nova Zembla southwards to the Mediterranean Sea (not in Spain, the Italian Islands or Greece) and Caucasus. Asia: from the mouth of the Yenisei R. to Chukch Penins., southwards to Persia, Turkestan, Tibet, Mongolia, northern China and Honshu. America: from the north coast of

Alaska and the Arctic Archipelago to Labrador, southwards to California, New Mexico, Nebraska, Illinois and New York. Greenland, except northernmost part. Also in Tierra del Fuego and in Patagonia.

Umbelliferae Morison.

Chaerophyllum bulbosum.

Georgi, Beschreib. III: 4 p. 855. — »*Chaer. aureum?*» Pennant, Arct. Zool. (1784) p. CXV.

The source of the reports of these plants from Kamtchatka is unknown to me. They should be excluded from the flora of our area.

583. ***Anthriscus nemorosa*** (M.B.) Spr., Umb. prodr. (1813) p. 27.

Cham. & Schlecht. in Linnaea I (1826) p. 390; Hook et Arnott in Beechy's Voy. p. 115; DC., Prodr. IV p. 223; Ledeb., Fl. Ross. II p. 347. — »*Chaerophyllum seminibus nitidis hispidis . . .*» Gmel., Fl. Sib. I p. 209. — *Daucus Carota* Kraschennin., Kamtsch. p. 108; Ledeb., Fl. Ross. II p. 338 quoad pl. Kamtsch.; Cfr. Rupr. Rev. Umbellif. Kamtsch. pp. 28, 29. — *Chaerophyllum sylvestre* Pennant, Arct. Zool. (1784) p. CXV; Georgi, Beschreib. III: 4 p. 855. — [*Chaerophyllum nemorosum* M.B., Fl. Taur. Caucas. I (1808) p. 232]; Rupr., Rev. Umbellif. Kamtsch. pp. 28, 30. — »Ein hochstammiges *Chaerophyllum*, unsrem *sylvestri* nicht unähnlich» Mertens, Bemerk. Fl. Koragins p. 65. — *Anthriscus sylvestris* Yabe & Yendo, Fl. Shimushu p. (189); Kozo-Poljanski in Acta Horti Petrop. XXXVI (1920) p. 102 (also subsp. *lejocarpa* Kozo-Polj.); Kudo, Fl. Paramush. p. 136; Kom. in herb. quoad pl. Kamtsch.

Northern Kuriles: Paramushir M. Aizava 1900; Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Kurile Lake noted by Hn; lower Ozernaja R. in *Filipendula kamtschatica* thickets noted by Hn; upper Unkanakchek R. noted in A. 199; middle Kuseten R. noted in A. 194; lower Kuseten R. noted in A. 195; Golygina village Aug. 8th 1921 Hn No. 2764; upper Ksudach R. in *Filipendula kamtschatica* thickets noted by Hn; middle and lower Tolmachovaja R. noted by Hn; the mouth of Balaganchik R. noted in A. 155; lower Bolshaja R. noted in A. 112; S. of Bolsheredsk July 13th 1921 Hn No. 2116; Bolsheredsk noted in A. 53, A. 54; Plotnikovaja R. 15 verst from Apatcha Rubinski 1908; S.E. of Bolsheredsk noted in A. 56; »Natchikinski ostrochka» July 22nd 1848 Vossnesensky; the hot springs at Natchika Komarov 1908; Korjaka Komarov 1908; Savoiko July 18th 1928 W. Eyerdam.

East Kamtchatka: Petropavlovsk Mertens, do. Chamisso 1816 (Hb. Berol.); Lake Assabatch Aug. 10th 1925 Malaise No. 494, do. Aug. 15th 1925 Malaise No. 492; Ustj-Kamtschatsk July 30th 1925 Malaise No. 493.

Central Kamtchatka: Shtchapina Komarov 1909; Klutchi Bezais 1908.

West and North Kamtchatka: Tigil Levitzky.

»Kamtchatka»: Kastalsky, Rieder »*nemorosum*» det. Rupr. 1857.

Noted in the following associations:

In *Salix sachalinensis—Filipendula—Geum* ass.:
Single (A. 195); Sparse (A. 53, A. 54, A. 112, A. 155).
In *Alnus hirsuta—Filipendula—Dryopteris* ass.:
Single (A. 199); Sparse (A. 194).
In *Angelica ursina—Filipendula—Thalictrum* ass.:
Sparse (A. 56).

In South Kamtchatka this plant is common in and along the borders of the *Filipendula kamtschatica* thickets. Sometimes it forms a vegetation which is possibly a distinct association lying on the transition-line between *Filipendula* thickets and common meadows (with *Artemisia* but usually without *Thalictrum*). It flowers from the beginning of July to the beginning of September.

It seems to me hardly possible to refer our plant to *Anthriscus silvestris* L. as a subspecies. The Kamtchatka plant and the Scandinavian one never resemble one another, the former being of higher growth, the leaves being much thinner and more compound, their segments longer-petiolated, and their underside provided with stiff white hairs. The upper stem-leaves have very narrow divisions, with long, narrow sheaths, strongly hairy at the mouth. The involucels are lanceolate to broadly lanceolate, long acuminated (not ovate to ovate-lanceolate as in *A. silvestris*). The mericarps are usually shorter and thicker than in *A. silvestris* and their surface varies from smooth (with a slight punctation) to strongly tuberculate-spinose. An attempt to divide the material into two types on the strength of the latter characteristic was without result.

The geographical area of our plant is difficult to state without a monographical treatment. Specimens from Manchuria and Yenisei show that it is common there, but further westwards, when it meets the area of *A. silvestris*, matters are more complicated. Thellung (Hegi, Ill. Fl. Mitt. Europ. V p. 1025), who regards the plant as a subspecies, reports it westwards to Italy.

Type of distribution: Eurasiatic.

Geographical area: Europe: Central and southern Italy, the Balkans, Hungary, central and southern Russia, Caucasus. Asia: Asia Minor, Syria, Persia, Fergana, throughout Siberia, Turkestan, Mongolia and Manchuria to Kamtchatka and Japan.

584. ***Pleurospermum uralense*** Hoffm., Plant. Umb. Gen. ed. I (1814) Praemonenda p. IX.

Pleurospermum camtschaticum Hoffm., loc. cit. p. X; DC., Prodr. IV p. 244 *(Kamtschaticum);* Ledeb., Fl. Ross. II p. 361 *(kamtschaticum);* Rupr., Rev. Umbellif. Kamtsch. p. 27. — *Pleurospermum austriacum* Kom., Voy. Kamtch. p. 456; Kudo, Fl. Paramush. p. 137.

Northern Kuriles: Paramushir Kudo 1920.

South Kamtchatka: Lower Ozernaja R. noted in A. 96, A. 100; Javina Rubinski 1909; upper Ksudach R. 125 m. Aug. 5th 1921 Hn No. 2657 (A. 83, A. 86); N. of Opala village noted by Hn; upper Savan R. noted in A. 79;

Assatcha mts. 400 m. Aug. 4th 1922 Hn No. 4160; upper Opala R. near Assatcha noted in A. 185; between the mouths of Opala and Bolshaja R. in *Epilobium angustifolium—Geranium—Majanthemum* ass. noted by Hn; middle Karymchina R. in meadow and *Angelica ursina* meadow noted by Hn; N.W. of Opala volcano noted in A. 66, A. 68; the junction of Tolmachovaja rivers noted in A. 157; upper Abshen R. in meadow noted by Hn; the mouth of Balaganchik R. noted in A. 152, A. 153; lower Bannaja R. in meadow noted by Hn; Plotnikovaja R. 15 verst from Apatcha Rubinski 1908; Mt. »Zaikin Mys», Paratunka Komarov 1908; Mt. Zerkalo, Natchika Komarov 1908, do. noted in A. 114, A. 119; Savoiko July 12th 1928 W. Eyerdam.

East Kamtchatka: Petropavlovsk Mertens, do. Perfiljef 1910, do. 165 m. Aug. 18th 1920 Hn No. 943.

Central Kamtchatka: Malka Protopopof 1908; near Pushtchina acc. to Kom. loc. cit.; Mashura Komarov 1909; Klutchi Bezais 1908.

West and North Kamtchatka: Kompakovaja Zelenin 1908; Tigil Levitzky; Pallan Savtchenko 1911.

»Kamtchatka»: »Hb. Prescott», Stewart, Liboschitz, Peters, Rieder 1833.

Noted in the following associations:
In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 66, A. 68, A. 79, A. 86, A. 114, A. 119, A. 153, A. 185);
Sparse (A. 83, A. 96, A. 100).
In *Betula platyphylla—Thalictrum—Carex* ass.:
Single (A. 152, A. 157).

In South Kamtchatka *P. uralense* is fairly common in the meadows of the lowlands, where it often occurs in masses in scattered spots. After floration the specimens die and in the following year often no *Pleurospermum* plant at all occurs in that place; thus the stems of the previous year's specimens often remain in meadows where no living specimen can be found.

Our plant was often taken to be *P. austriacum* (L.) Hoffm. All Siberian specimens, however, differ from those from Europe in several important characteristics and must certainly be regarded as a separate species. The Siberian plant was described by Hoffman as *P. uralense* and as *P. camtschaticum*, the former having only one oil-tube at each interval of the carpel, while the latter was said to have two. This characteristic varies a good deal and no constant difference seems to exist. The entire Siberian plant has oil-tubes with small round lumen — often two — at any of the intervals (but not at all of them), while the European plant has oil-tubes with broader and more flattened lumen, usually only one (but occasionally two) at the intervals. As no important difference exists between the Kamtchatka plant and specimens from western Siberia, I here take them to be one species under the name of *P. uralense*.

P. uralense differs from *P. austriacum* in the following characteristics. The whole plant is lower, usually only about 50—80 cm. high (*P. austriacum* often about 1,5 m.). The ribs of the carpel are winged with a distinct toothed edge. (Sometimes, although rarely and not so distinctly, occurring also in *P. austriacum*.) The umbel-rays are more scabrous and sharply angulated. The leaves are usually strongly dissected with long-acuminated sections. (In *P. austriacum* much less dissected with broad abruptly acuminated or sometimes practically blunt sections.) The involucre is strongly dissected. (In *P. austriacum* it usually consists of simple or sometimes slightly dissected leaves.) The veins on the underside of the leaves and their margin are more hairy than in *P. austriacum*.

Taken separately, these characteristics are sometimes not so prominent, but no European specimens have them all united in one specimen, whereas this is always the case with Siberian specimens. A distinct difference is thus present, and the types must be taken as separate species.

Type of distribution: Siberian.

Geographical area: Europe: from Kazan, Perm and Samara provinces eastwards. Asia: at Yenisei from about 70° N. lat., from Vilju distr. and northern Kamtchatka southwards to Akmolinsk prov., northern Mongolia, northern Corea and Honshu. *P. austriacum* only in Europe from Eifel and the French alps eastwards to West Prussia, Minsk prov. and Roumania; also in Sweden (one small area at about 58° N. lat.)

585. ***Bupleurum triradiatum*** Adams ex Hoffm., Umb. Gen. ed. 2 (1816) p. 115.

Rupr., Rev. Umb. Kamtsch. p. 26 (var. *alpina*, var. *oblongifolia*); Kozo-Poljanski in Acta Horti Petrop. XXX (1915) p. 198 (var. *α Adamsii*, var. *β humilis*, var. *δ arcticum*); Kozo-Poljanski in Fedtsch., Fl. As. Ross. Vyp. 10 (1915) p. 14. — »... ein kleines *Bupleurum*» Mertens, Bemerk. Fl. Koragins p. 64. — *Bupleurum ranunculoides* var. *α triradiatum* Regel & Tiling, Fl. Ajan. p. 96. — *Bupleurum ranunculoides* var. *β triradiatum* Wolff in Engler, Pflanzenr. IV: 228 (Heft 43) p. 117.

South Kamtchatka: Lopatka and Piratkof Rieder 1831 (sub *B. angulosum* and *B. triradiatum* var. *humilior* Rupr. 1857); Shadutka volcano 1125 and 1260 m. noted by Hn; Topik 580 m. July 28th 1921 Hn No. 2488, do. 470 m. noted by Hn; Assatcha mts. 1100 m. Aug. 10th 1922 Hn No. 4185; Opala volcano 800 m. July 21st 1921 Hn No. 2336; Mt. »Zaikin Mys» Paratunka Komarov 1908; Lake Natchika Komarov 1908; Mt. Trubi, Vilju R. Komarov 1908; the sources of Poperochnaja R. Komarov 1908.

East Kamtchatka: The hot spring at Nalutcheva R. Aug. 1st 1928 P. T. Novograblenof; Korjatskaja volcano Aug. 13th 1928 W. Eyerdam.

Central Kamtchatka: Ganalski Vystraki July 18th 1924 P. T. Novograblenof (two forms); Ganala and Malka Stewart; the foot of Korjaka volcano Komarov 1908; Anauna R. Aug. 18th 1926 Malaise No. 137, do. Aug. 19th 1926 Malaise Nos. 136, 138, do. Sept. 5th 1926 Malaise No. 139.

West and North Kamtchatka: Tigil Bezais 1909 (Hb. Berol.); between Sedanka and Jelovka Bezais 1909.

»Kamtchatka»: Peters.

In South Kamtchatka this plant is not common. It occurs here and there in the alpine region, especially on high peaks. It flowers in July and August.

The specimens from South Kamtchatka keep together as a fairly distinct type characterized by very broad, short orbicular, curved cauline leaves. The form of the basal leaves varies considerably but on the average they may be said to be comparatively broad and short. The umbel-rays are usually three, occasionally two or four. This type had already been distinguished by Ruprecht loc. cit. as var. *alpina* (Pl. I fig. i, j). The northern plant, especially the specimens from Sedanka-Jelovka, Tigil and Malaise No. 139, differs remarkably from this variety in having long, lanceolate cauline leaves, and, judging from the few specimens at hand, more numerous umbel-rays.

Some of the specimens from Central Kamtchatka are more or less intermediate between these forms. Ruprecht probably did not see this northern type in its pure form from Kamtchatka, but the intermediate forms from Central Kamtchatka he named »*oblongifolia*». The northern plant was described by Regel in Regel & Tiling, Fl. Ajan. p. 97 as *B. ranunculoides* var. *δ arcticum*. It is closely related to var. *ajanense* described by Regel loc. cit., to which variety some of the specimens from Anauna R. may be said to belong. It seems to me that those two forms — the southern var. *alpinum* Rupr. and the northern var. *arcticum* Regel —, as well as the typical form of the species, var. *Adamsii* Kozo-Polj., should rather be regarded as subspecies, as they seem to have distinct geographical areas. *B. purpureum* Blanksp., of which I have seen a specimen, hardly belongs to our species as Kozo-Poljanski proposes.

Type of distribution: Eastern Asiatic—Western American.

Geographical area: Subsp. *Adamsii:* from Kuznetski Alatau eastwards, southern Yeniseisk prov., southern Irkutsk prov., Transbaikalia, northern Amur and Primorsk provinces. Subsp. *alpinum:* southern Kamtchatka and (acc. to Wolff loc. cit.) Saghalin and Yezo. Subsp. *arcticum:* Ajan, northern Kamtchatka, Chukch Penins. Alaska (Port Clarence!, Promont. Espenberg!, Herchel Island acc. to the figure Pl. VII fig. 4 in Macoun & Holm, Canad. Arct. Exp.). Possibly all Alaska specimens referred to *B. americanum* by Coulter & Rose (Contr. U. S. Nat. Herb. VII: 1 1900 p. 85) belong to this type.

586. ***Cicuta virosa*** L., Sp. pl. ed. I (1753) p. 255.

Krascheninn., Kamtsch. p. 112; Pennant, Arct. Zool. (1784) p. CXV; Georgi, Beschreib., III: 4 p. 853; ?Mertens, Bemerk. Fl. Koragins p. 65; Ledeb., Fl. Ross. II p. 241; Rupr., Rev. Umbellif. Kamtsch. p. 24; Kom., Voy. Kamtch. p. 455; Kozo-Poljanski in Acta Hort. Petrop. XXXVI (1920) p. 14; Wolff in Engler, Pflanzenr. IV: 228 (Heft 90) p. 77. — ?*Cicutaria Wepferi* Pallas in Stralsund. Mag. II (1768) p. 173 and V (1769) p. 433.

South Kamtchatka: Ozernaja R. 30 verst from the mouth RUBINSKI 1909; Golygina village noted by HN; Akhomten Bay noted by HN; near the mouth of Bolshaja R. July 5th 1921 HN No. 1996; the hot springs at Bannaja R. 440 m. in water + 35° C. Sept. 12nd 1921 HN No. 3205; Perischeik, Tarja Bay PERFILJEF 1910; Bogatyrjovka July 10th 1920 HN No. 478; the hot springs at Natchika KOMAROV 1909, do. Sept. 2nd 1921 HN No. 3002 b.

East Kamtchatka: Between Petropavlovsk and Savoiko July 26th 1928 W. EYERDAM; Uzon crater, at hot springs KOMAROV 1909.

Central Kamtchatka: Mashura KOMAROV 1909, do. PROTOPOPOF 1909; Klutchi BEZAIS 1908.

West and North Kamtchatka: ?Karaginsk Island acc. to MERTENS loc. cit. MERTENS says that only leaves were seen and thus the possibility exists that the plant observed was *Sium cicutifolium*.

»Kamtchatka»: MERTENS, PETERS, RIEDER No. 24.

In South Kamtchatka *C. virosa* is less common though often occurring in the hot springs. The specimen from Bannaja has ripe seeds. Forms with broad leaf-sections (var. *latisecta* CELAK.) occur.

Type of distribution: Eurasiatic.

Geographical area: Europe: from central Norway, southern Kola and Archangelsk prov. southwards to France, (Spain?), northern Italy and southern Russia. Asia: at Yenisei from about 71° N. lat., from Kolyma and northern Kamtchatka southwards to Kashmir, northern Mongolia, Chili and Kiushiu. From Alaska to Oregon *C. Douglasii* (DC.) COULT. & ROSE of which I have not seen any specimens.

587. ***Sium cicutifolium*** SCHRANK, Baier. Fl. I (1789) p. 558 *(cicutaefolium)*.[1]

RUPR., Rev. Umbellif. Kamtsch. p. 25; WOLFF in ENGLER, Pflanzenr. IV: 228 (Heft 90) p. 346. — »*Cicuta virosa* L.? varietas *angustifolia*» ERMAN, Verzeichn. No. 64 p. 58. — »*Cicuta virosa β tenuifolia* ERMAN, Verzeichn. n. 64» RUPR., loc. cit. p. 25 (pro errore).

South Kamtchatka: Paratunka RIEDER No. 23 1833 (sub *Atamantha*?) (Probably the same as that reported by ERMAN loc. cit. from »Südspitze von Kamtschatka».)

East Kamtchatka: Petropavlovsk DOBROTVORSKY 1881.

Central Kamtchatka: Sharomsk KOMAROV 1909; the Mashura lakes KOMAROV 1909, do. PROTOPOPOF 1909; Ulovni R. BEZAIS 1908 (Hb. Berol.); Ushki PROTOPOPOF 1909; Klutchi BEZAIS 1908, do. GRINOP 1909; »Ad margines fluvii Kamtschatka Sept. 1846» VOSSNESENSKI.

[1] KOZO-POLJANSKI in Bull. Soc. Nat. Mosc. 28 (1915) p. 182 substitutes the name *cicutifolium* with *lineare* maintaining that *S. cicutaefolium* SCHRANK was another plant than GMELIN's *S. cicutaefolium*. To me it seems that SCHRANK merely cites GMELIN and gives GMELIN's plant the name *S. cicutifolium* in order to establish binominal nomenclature. KOZO-POLJANSKI loc. cit. also establishes a new genus — *Drepanophyllum* — to which he takes our plant.

»Kamtchatka»: STEWART, KITTLITZ acc. to RUPR. loc. cit., RIEDER No. 73 and 74, »RIED. Kamt. Ad ERMAN Hb. CHAM *Cicuta virosa angustifolia?*» (Hb. Acad. Petrop.).

The early reports from Petropavlovsk and Paratunka — although not improbable — need confirmation. The plant is hardly common in Kamtchatka, as RUPRECHT says.

Type of distribution: American, transgressing into Eastern Asia.

Geographical area: Asia: from about Lake Baikal eastwards, to the north from Olekminsk distr., southern Jakutsk distr. and Udskoi southwards to Chili, Corea, Saghalin and Yezo, also in Central Kamtchatka. America: from British Columbia, Saskatchewan, Great Slave Lake and Newfoundland southwards to California, Utah, Colorado and Virginia, acc. to SMALL to Florida and Louisiana.

588. ***Carum Carvi*** L., Sp. pl. ed. I (1753) p. 263.

RUPR., Rev. Umbellif. Kamtsch. p. 24. — *Carum buriaticum* KOM. in herb. non TURCZ.

South Kamtchatka: Bolsheredsk VOSSNESENSKY acc. to RUPR. loc. cit., do. July 10th 1921 HN No. 2070, do. Aug. 22nd 1921 HN No. 2909; Apatcha village noted by HN; Nikolajevsk KOMAROV 1908; Savoiko July 9th 1920 HN No. 356 a; Korjaka village noted by HN.

East Kamtchatka: Petropavlovsk MERTENS acc. to RUPR. loc. cit., do. PERFILJEF 1910.

Central Kamtchatka: Vershne-Kamtchatsk KITTLITZ; Milkova PROTOPOPOV 1908; Tolbatchik BEZAIS 1908, do. PROTOPOPOV 1909.

»Kamtchatka»: KUSMISCHEFF, STUBENDORFF acc. to RUPR. loc. cit.

In South Kamtchatka this plant only occurs in or near villages. It is certainly not indigenous there. Ripe seeds were observed at the end of August.

Most of the specimens have an involucre of up to 6 filiform or narrowly lanceolate leaves. The involucels are usually present as very short scales which sometimes (for instance, in the spec. from Tolbatchik collected by PROTOPOPOF) grow out into short lanceolate leaves. Similar forms (f. *intermedium* ROUY. et CAM.) can be found also in the Scandinavian material of the species, but they seem to be much more common in the Kamtchatka material. From *C. buriaticum* TURCZ. our plant differs in its less dissected leaves and in the form of the involucre and involucels. Even RUPRECHT loc. cit. points out that the Kamtchatka plant does not belong to that species.

Type of distribution: Cosmopolite.

Geographical area: Europe: from Iceland, northern Scandinavia and northern Perm prov. southwards to northern Spain, central Italy, Bulgaria and Caucasus. Asia: at Yenisei from about 61° N. lat. southwards to Asia Minor, southern Persia, the Himalayas and Sze-ch'uan, also in Kamtchatka, cultivated in Japan, India and other countries. America: naturalized in many places. Cultivated, *inter alia,* in northern Africa, New Zealand and S. America.

589. ***Conioselinum Gmelini*** (CHAM. & SCHLECHT.) COULT. & ROSE in Contr. U. S. Nat. Herb. VII No. 1, 1900 p. 150.

[*Ligusticum Gmelini* CHAM. & SCHLECHT in Linnaea I (1826) p. 391]. — *Conioselinum kamtschaticum* RUPR., Rev. Umbellif. Kamtsch. pp. 22, 30; FEDTSCH., Fl. Îl. Comm. p. 64 pro parte. — ? *Selinum Benthami* WATS., YABE & YENDO, Fl. Shimushu p. (189).

Northern Kuriles: ? Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Lopatka RIEDER 1831; N. of Illina volcano noted in A. 207; between Javina and Kochegochek Aug. 13th 1921 HN No. 2869 (A. 94); middle Kochegochek R. noted in A. 90 b; between Kochegochek and the mouth of Golygina R. Aug. 14th 1921 HN No. 2876 (A. 102); Shol-

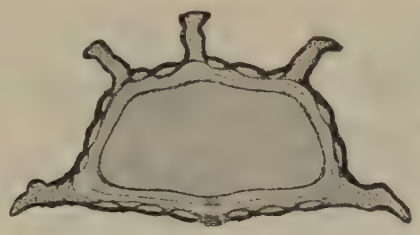


Fig. 15. Cross-section of carpel of *Conioselinum Gmelini*. Enlarged 20: 1.

tovskaja volcano 500 m. Aug. 23rd 1922 HN No. 4380; middle Kidipalok R. Sept. 5th 1922 HN No. 4501 and 4518; Golygina on sand dunes RIEDER 1833.

Commander Islands: Bering Island KJELLMAN, GREBNITZKY 1894; Copper Island DOBROTVORSKY.

West and North Kamtchatka: Karaginsk Island POSTELS (Hb. FISCH.).

Noted in the following association:

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 90 b, A. 94, A. 207); Sparse (A. 102).

In South Kamtchatka this plant was only observed in the southernmost part, where it takes the place of *Cnidium ajanense*, with which it has much in common (compare under that species). It is with some hesitation that I refer our plant to the above species. It was described by RUPRECHT (on specimens from Golygina collected by RIEDER) as *C. kamtschaticum*, with which the Japanese and Saghalin plant was later identified. However, I cannot find any line of demarcation between the Asiatic plant and the American, and it agrees well with specimens labelled by CHAMISSO »*Ligusticum Gmelini* nob.» The American plant is usually larger than the Kamtchatkan one, but this might be natural when we consider that the climatic conditions in southern, especially in southwestern, Kamtchatka are nearly arctic. The plant from Commander Islands is higher-grown, as also are those from Japan and Amur prov., and I cannot see any reason for distinguishing them from the American. A

plant called *Conioselinum Gmelini* was thus named by STEUDEL as early as in 1840 (Nomencl. I ed. 2 p. 403). It seems probable that his name also refers to the plant now in question as he gives »Siberia» as its home and cites *Ligusticum Gmelini* CHAM. & SCHLECHT. as a synonym. Our plant is certainly closely related to *C. vaginatum* (SPRENG.) THELLUNG (= *C. Tataricum* FISCH. = *C. Fischeri* WIMM. & GRAB.) and it might be doubtful if it can be specifically distinguished from that species.

The oil-tubes are one to three in each interval (often two in the lateral and one in the median, sometimes only one in each). Compare fig. 15. The leaves have a triangular circumference. (Comp. fig. 16 a). They have 3—4 pairs of leaflets, each leaflet being dissected into 2—3 pairs of pinnulae and



Fig. 16. Leaves of: a *Conioselinum Gmelini* (HN No. 4501); b, c *Cnidium ajanense* (HN No. 1289).

each pinnula being more or less deeply divided into three parts or sections, which are finally serrated or shallowly dissected, the ultimate sections being long-acuminated. The sheaths of the upper leaves are large, strongly inflated, scarious-margined and often red.

Type of distribution: Northern Pacific.

Geographical area: Asia: the mouth of Amur R., Saghalin, Yezo, the Kuriles, southernmost Kamtchatka Penins., Commander Islands, N.E. coast to Chukch Penins. America: the Aleutian Islands, Pribilof Islands, Eschscholtz Bay (acc. to CHAM. loc. cit.), southern Coast of Alaska, and southwards to Oregon.

C. Fischeri from northern Norway, Karelia, Prussia, the Carpathians and the eastern Alps (isolated spot), eastwards. In Asia from lower Yenisei, Lena and ? Kolyma, southwards at least to northern Mongolia. In Eastern America the closely related *C. pumilum* ROSE and others (compare FERNALD in Rhodora 28 (1926) p. 221).

590. ***Cnidium ajanense*** (Regel & Tiling) Drude in Engler & Prantl., Nat. Pfl. Fam. III: 8 (1898) p. 210.

?Kudo, Fl. Paramush. p. 137. — *Conioselinum Gmelini* Rupr., Rev. Umbellif. Kamtsch. p. 20 pro maxima parte. — *Conioselinum kamtschaticum* var. *alpina* Rupr., Rev. Umbellif. Kamtsch. p. 30. — [*Tilingia ajanensis* Regel in Regel & Tiling, Fl. Ajan (1858) p. 97]; Fedtsch., Fl. Îl. Comm. p. 64.

Northern Kuriles: ?Paramushir acc. to Kudo loc. cit.

South Kamtchatka: Between the mouths of Golygina and Opala rivers Sept. 10th 1922 Hn No. 4562; N. of the mouth of Opala R. noted in A. 214; Lake Sterbot Rubinski 1909; Akhomten Bay Aug. 30th 1920 Hn No. 1171 (Malaise); do. 1250 m. Sept. 9th 1920 Hn No. 1218 (A. 37 a, A. 37 b), do. 250 m. Sept. 11th 1920 Hn No. 1289; Mutnovskaja volcano 800 m. July 28th 1922 Hn No. 4041 (A. 172); Gorelaja volcano noted in A. 162, A. 167, A. 169; Opala volcano 620 m. July 21st 1921 Hn No. 2262 (A. 78 a), do. 1100 m. July 23rd 1921 Hn No. 2378; Lake Tolmachovaja 600 m. July 12th 1922 Hn No. 3902 (A. 159), do. July 13th 1922 Hn No. 3906; the Kohelok Pass 750 m. Sept. 11th 1921 Hn No. 3130 (A. 125); upper (Paratunka-) Bystraja R. noted in A. 128; Mt. »Zaikin Mys», Paratunka Komarov 1908; Shalsan Vossnesensky, do. 700 m. Sept. 1st 1921 Hn No. 2984 b; Natchika, Mt. Zerkalo 820 m. Sept. 3rd 1921 Hn No. 3025 (A. 117); Mt. Palovinaja 900 m. July 8th 1920 Hn No. 318; Poperochnaja R. Korjaka valley Komarov 1908.

East Kamtchatka: Ustj Kamtchatsk Aug. 25th 1925 Malaise No. 496, do. Sept. 5th 1925 Malaise No. 495.

Commander Islands: Copper Island Dybovsky 1879.

Central Kamtchatka: Mt. Zerkalo, Malka July 27th 1924 P. T. Novograblenof (Hb. Holm.); Ganala Kittlitz (sub *Conioselinum kamtschaticum* var. *alpinum* Rupr.); Anauna R. Aug. 19th 1926 Malaise No. 134.

West and North Kamtchatka: Between Tigil and Sedanka Bezais 1909; Pallan Savtchenko 1911; Karaginsk Island Mertens.

Noted in the following associations:

In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Single (A. 78 a, A. 125).

In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 37 b, A. 128); Sparse (A. 37 a).

In *Vaccinium—Empetrum*—Moss ass.:
Single (A. 172, A. 214).

In *Vaccinium—Empetrum—Rhododendron chrysanthum* ass.:
Single (A. 117, A. 162, A. 167, A. 169).

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 159).

In South Kamtchatka this plant is common in heaths and meadows of the alpine region.

That our plant belongs to the above species is clear. It agrees well with the specimens from Ajan, from which *C. ajanense* is described. It seems more doubtful whether it should be included in the genus *Cnidium*. The lateral ribs of the carpels are markedly larger than the dorsal and must be said to be winged, as a differentiation between the wing and the rib can be seen on a section of the carpel. The oil-tubes under the intervals number 2—3, the commissurial 4—6. In these characteristics our plant agrees with *Conioselinum* and might better be referred to that genus, all the more as certain difficulties seem to exist in distinguishing our plant sharply from the Kamtchatka form of *Conioselinum Gmelini*, although the plants are quite different when the ultimate forms in the series are compared. The possibility must be born in mind that some of the forms from southernmost Kamtchatka may be hybrids, as it is only with difficulty and somewhat subjectively that they could be divided into the respective groups.

The most differentiated type of *C. ajanense* is represented by the specimens from Akhomten Bay; more northern specimens agree well with the plant from Ajan, Ochotsk and Gishiga, sections of whose leaves are somewhat longer, while southern specimens are sometimes doubtfully distinct from *Conioselinum Gmelini*. It would be of interest to study these species in the Commander Islands, where both are represented. From *Conioselinum Gmelini* our plant differs in the following respects: the whole plant is more tender, with straight upright stem and smaller radical leaves. The stem has one, more rarely two, much less inflated sheaths. The pedicels are more glabrous and the involucels usually shorter than the pedicels, while those of *Conioselinum Gmelini* are usually longer. The sepals are distinct (in *C. Gmelini* occurring only occasionally). The leaves are less dissected and have an ovate to ovate-triangular circumference. They have 1—2 (—3) pairs of leaflets; the lowest pair is petiolated and dissected to the base into three segments, each segment being tripartite and its parts sometimes once more divided. (Compare fig. 16 b, c.) The ultimate sections are blunt or more or less abruptly contracted to a short point. Compare also under *Conioselinum Gmelini*.

Type of distribution: Asiatic Pacific.

Geographical area: from Jakutsk prov. (Batoma R.), Gishiga and Chukch Penins. southwards to Ajan, Saghalin, N. Amur and Ussuri provinces (acc. to Kom.), and Honshu (acc. to Kudo 1925), also in Commander Islands.

591. ***Ligusticum mutellinoides*** (Crantz) Villar, Prosp. hist. pl. Dauph. (1779) p. 25.

[*Laserpitium Mutellinoides* Crantz, Class. Umbell. Emend. (1769) p. 67.]

Central Kamtchatka: Kashkan R., Pushtchina Komarov 1909 (sub *Pachypleurum alpinum*).

The specimen is without fruits, but the shape of the leaves, the numerous rays of the umbels and the shape of the involucre show that it must belong to this species. Concerning the question of the name, compare THELLUNG in HEGI, Ill. Fl. Mitt. Europ. V p. 1323.

Type of distribution: Eurasiatic, arctic-alpine.

Geographical area: Europe: the Alps, the Carpathians (subsp. *simplex* THELL.); Kolgujef, Samoyede Land, Nova Zembla, the Urals southwards to Orenburg. Asia: along the North Coast to Chukch Penins., southwards to Ochotsk, Gishiga and Kamtchatka, also in Altai, Sayan Mts. and mts. of Mongolia and Transbaikalia.

592. ***Ligusticum scoticum*** L., Sp. pl. ed. I (1753) p. 250 (*scothicum*).

HOOK. & ARNOTT in Beech's Voy. p. 115; LEDEB., Fl. Ross. II p. 286; RUPR., Rev. Umbellif. Kamtsch. p. 23; YABE & YENDO, Fl. Shimushu p. (189); FEDTSCH., Fl. Îl. Comm. p. 64; KOM., Voy. Kamtch. pp. 27, 147, 349, 452; KUDO, Fl. Paramush. p. 183. — »*Angelica foliolis tripartitis* . . .» GMEL., Fl. Sib. I p. 193.

Northern Kuriles: Paramushir C. TARO 1882, KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: S. of Kambolnaja R. RUBINSKI 1909; »Oxernoi» (= Ozernaja) Hb. Sapporo; N. of the mouth of Ozernaja R. noted by HN; Kochegochek Sept. 9th 1922 HN No. 4551; the mouth of Opala R. noted by HN; Lake Sterbot noted in A. 216; between the mouths of Opala and Bolshaja R. in *Epilobium angustifolium—Geranium—Majanthemum* ass. noted by HN; Akhomten Bay noted in A. 24 b; S. of Sykovaja village noted in A. 217; Os Bolsheredsk KOMAROV 1908; Paratunka STUBENDORFF 1849; Tarja Bay KOMAROV 1908; Bogatyrjovka July 16th 1920 HN No. 451 b; Avatcha Bay acc. to HOOK. & ARNOTT loc. cit.

East Kamtchatka: Near the entrance of Avatcha Bay PERFILJEF 1911; Petropavlovsk MERTENS, do. WRIGHT 1853—56, do. DOBROTVORSKY 1881, do. BOGDANOVITSCH 1898, do. A. I. RUBINSKAJA (Hb. Acad. Petrop.), do. PERFILJEF 1910 (Hb. Berol.), do. Aug. 17th 1920 HN No. 932; between Semjatchik and Shupanova acc. to KOM. loc. cit.; Ustj Kamtchatka KURTASHOF 1902; »Ad margines fl. Kamtschatka Aug. 30 1846» VOSSNESENSKY.

Commander Islands: Bering Island KJELLMAN, DOBROTVORSKY 1881, GREBNITZKY 1894 and acc. to FEDTSCH. loc. cit. DYBOVSKY and STEJNEGER; Copper Island DYBOVSKY 1879, DOBROTVORSKY 1881 and acc. to FEDTSCH. loc. cit. TILMAN and MOROZEVICZ.

West and North Kamtchatka: Tigil LEVITZKY (the place is not given in the original label); Uka Sept. 4th 1920 KOSLOVSKY.

»Kamtchatka»: KRASCHENINNIKOF acc. to GMEL. loc. cit., KASTALSKY, DYBOVSKY.

Noted in the following association:

In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Single (A. 24 b, A. 217); Sparse (A. 216).

In South Kamtchatka *L. scoticum* is a common plant both along the eastern and the western shore. It occurs in the *Elymus* belt and in the meadows inside this belt. It flowers in July and August.

Type of distribution: Bicentric, Northern Atlantic and Northern Pacific.

Geographical area: Europe: Iceland, the Faroes, Scotland, northern Ireland, N.E. England and from Denmark and S.W. Sweden along the coast to the White Sea. Asia: from Baron Korf Bay (probably from Chukch Penins.) southwards along the shore to Honshu, and South Ussuri; also on the shores of the Ochotsk Sea. America: Alaska from 67° N. lat. southwards to 52° N. lat. and from Labrador 56° N. lat. southwards to New York 41° N. lat. Also W. Greenland (to 66° N. lat.).

593. ***Coelopleurum Gmelini*** (DC.) LEDEB., Fl. Ross. II (1844—46) p. 361.

RUPR., Rev. Umbellif. Kamtsch. pp. 12, 30; YABE & YENDO, Fl. Shimushu p. (189); FEDTSCH., Fl. Îl. Comm. p. 65 (excl. pl. leg. STELLER); KUDO, Fl. Paramush. p. 138. — ?»*Angelica foliorum impari lobato . . .*» GMEL., Fl. Sib. I p. 192 quoad pl. Kamtsch. — *Archangelica Gmelini* DC., Prodr. IV p. 170. — *Angelica arcangelica* PENNANT, Arct. Zool. (1784) p. CXV; GEORGI, Beschreib. III: 4 p. 850 quoad pl. Kamtsch. — *Angelica sylvestris* MERTENS, Bemerk. Fl. Koragins p. 61.

Northern Kuriles: Paramushir S. YOKOYAMA 1893 acc. to KUDO loc. cit., KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka June 24th 1920 HN No. 136; the seashore at Kambolnaja R. RUBINSKI 1909; Kurile Lake near the estuary of the river Aug. 28th 1922 HN No. 4443; lower Ozernaja R. Aug. 12th 1921 HN No. 2813 (A. 96); S. of Golygina village in meadow noted by HN; upper Ksudach R. 125 m. Aug. 4th 1921 HN No. 2656 (A. 83); between the mouths of Opala and Golygina rivers noted by HN; the western Shadutka R. noted in meadow by HN; the northern slope of Assatcha mts. 650 m. noted by HN; between the mouths of Opala and Bolshaja rivers noted by HN; N.W. of Opala volcano noted in A. 66, A. 67; upper Abshen R. 250 m. July 17th 1921 HN No. 2199; Os-Bolsheredsk KOMAROV 1908; 10 km. W. of Bolsheredsk Aug. 26th 1921 HN No. 2954, 2955; Ozernaja R. Paratunka KOMAROV 1908; Lake Dalni KOMAROV 1908; Starichkoff Island (= Toporkoff Isl. Sarannaja Bay) PERFILJEF 1911; Nikolajevsk KOMAROV 1908; Ozdets R. KOMAROV 1908; Mt. Zerkalo, Natchika KOMAROV 1908, do. 340 m. Sept. 3rd 1921 HN No. 3006 (A. 114, A. 119); between Avatcha and Hutor KOMAROV 1908; upper Korjaka valley KOMAROV 1908.

East Kamtchatka: Petropavlovsk MERTENS, do. BOGDANOVITSCH, do. PERFILJEF 1910, do. 165 m. Aug. 16th 1920 HN No. 969 (A. 7), do. July 10th 1928 W. EYERDAM; between Petropavlovsk and Avatcha volcano 250 m. Aug. 24th 1920 HN No. 1075, 1081; Nalutcheva PERFILJEF 1910; Avatcha volcano 675 m. Aug. 4th 1920 HN No. 730; Semjatchik KOMAROV 1909; Uzon crater KOMAROV 1909; Lake Kronoki KOMAROV 1909; Klutchefskaja volcano 3000 feet BEZAIS 1909; Ustj-Kamtchatsk PROTOPOPOF 1909.

Commander Islands: Bering Island KJELLMAN and STEJNEGER acc. to FEDTSCH. loc. cit., GREBNITZKY 1894.

Central Kamtchatka: Klutchi, Tchuchovka mts. BEZAIS 1908.

West and North Kamtchatka: Kol RUBINSKI 1908; Tigil GUDZENKO 1910; Pallan SAVTCHENKO 1911; Karaginsk Island MERTENS, do. LOGINOVSKI 1910.

»Kamtchatka»: »Hb. MEYER», RIEDER (sub *Aegopodium podagraria*).

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 66, A. 67, A. 83, A. 114, A. 119); Sparse (A. 96).

In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 7).

C. Gmelini is often said to be a sea-shore plant. In South Kamtchatka, however, it is not confined to the shore but occurs also quite far inland. In the central part of the country it is not known and thus belongs to the group of plants which occur on a narrow strip along the Pacific shores but avoid the more continental parts. It occurs in the meadows of the lowlands and the subalpine belt. It flowers in July and the beginning of August.

C. Gmelini was described from specimens collected in our area. The lateral ribs of the fruits are sometimes slightly, sometimes distinctly, broader than the dorsal. Two oil-tubes are to be found under each rib and one under each interval. The ripe fruit is 6—8 mm. long. In W. America COULTER & ROSE distinguished a new species *C. longipes* from our plant, apparently chiefly owing to the length of the fruits, which, according to them, is about 9 mm. long in *C. Gmelini* and only 4—6 mm. long in *C. longipes*. I have not seen any specimen undoubtedly belonging to the latter species, which, however, seems to be doubtfully distinct from our plant. The specimen from Cape Lopatka is very low-grown (stem about 3 cm., leaves about 10 cm.) agreeing closely with the plants collected by KJELLMAN at St. Lawrence Island and Konyam Bay (published as *Angelica Archangelica*). It apparently represents the arctic form of our species.

Type of distribution: Northern Pacific.

Geographical area: Asia: from about Bering Straits southwards along the coast to South Ussuri and Yezo. America: from about Bering Straits southwards along the coast to Southern Alaska. From Southern Alaska along the coast to Oregon (*C. longipes* COULTER & ROSE acc. to COULTER & ROSE.) In E. America the closely related *C. lucidum* (L.) FERN.

594. ***Angelica genuflexa*** NUTT. in TORR. & GRAY, Fl. N. Amer. I (1840) p. 620.

»*Angelica foliolis aequalibus, ovato-lanceolatis . . .*» GMEL., Fl. Sib. I p. 192 quoad pl. Kamtsch. — ». . . eine Art *Angelica*» STELLER in PALLAS, Neue Nord. Beytr. II (1781) p. 301; *Angelica sylvestris* PENNANT, Arct. Zool. (1784) p. CXV; LEDEB.,

Fl. Ross. II p. 296 quoad pl. ex insula Beringii; RUPR., Rev. Umbellif. Kamtsch. p. 10 (non L.). — *Angelica refracta* FR. SCHM., Fl. Sachalin in Mém. Ac. Imp. Sc. St. Petersb. Sér. VII T. XII: 2 (1869) p. 138; KUDO, Fl. Paramush. p. 139; KOMAROV in herb.

Northern Kuriles: Paramushir KUDO 1920.

South Kamtchatka: Kurile Lake Aug. 27th 1922 HN No. 4408; lower Ozernaja R. Aug. 12th 1921 HN No. 2826 (A. 97); lower Kidipalok R. noted by HN; upper Unkanakchek R. Aug. 20th 1922 HN No. 4335 (A. 196, A. 197, A. 200); the junction of Golygina and Ksudach rivers noted in A. 90; Sahach noted by HN; middle Kusingen R. noted by HN; upper Ksudach R. 125 m. Aug. 5th 1921 HN No. 2687 (A. 85); near Topik volcano noted by HN; Lake Kambolnoje noted in A. 221; upper Opala R. noted in A. 181; the hot spring at upper Opala R. Aug. 2nd 1922 HN No. 4118; Akhomten Bay Sept. 10th 1920 HN No. 1269; lower Bolshaja R. noted in A. 112; Agashka R. 250 m. July 16th 1921 HN No. 2168 (A. 62, A. 64); the hot springs at upper Karymchina R. 400 m. Sept. 10th 1921 HN No. 3090; 10 km. W. of Bolsheredsk Aug. 26th 1921 HN No. 2956; islands at the mouth of Bystraja R. noted in A. 55; Bolsheredsk KOMAROV 1908; lower Bannaja R. noted by HN; the hot spring »Malenki klutchik» Bannaja 375 m. Sept. 12th 1921 HN No. 3153 (with ripe fruits); Paratunka »July 31st» STUBENDORFF; Bogatyrjovka PERFILJEF 1910; Lake Natchika KOMAROV 1908; Natchika KOMAROV 1908; between Korjaka and Natchika KOMAROV 1908; the mouth of Palovinaja R. KOMAROV 1908; Savoiko July 7th 1920 HN No. 249 b; Hutor KOMAROV 1908.

East Kamtchatka: Petropavlovsk PERFILJEF 1910, do. Aug. 16th 1920 HN No. 891; Kalashtyrka PERFILJEF 1910; between Petropavlovsk and Avatcha volcano 250 m. Aug. 21st 1920 HN No. 991, 992; the mouth of Ilkinoj R. KOMAROV 1909; Lake Kronoki KOMAROV 1909.

Commander Islands: Bering Island acc. to STELLER loc. cit.

Central Kamtchatka: The Natchika Pass KOMAROV 1908; Milkova DYBOVSKY 1879; Shtchapina KOMAROV 1909; between Shtchapina and Tolbatchik BEZAIS 1908; Lake Kurarotchnoje AFANASEJEV 1909.

West and North Kamtchatka: Kol RUBINSKI 1908.

»Kamtchatka»: KASTALSKY acc. to RUPR. loc. cit.

Noted in the following associations:

In *Salix sachalinensis—Filipendula—Geum* ass.:
Single (A. 112); Sparse (A. 55, A. 97).

In *Alnus hirsuta—Filipendula—Dryopteris* ass.:
Single (A. 200).

In *Filipendula—Calamagrostis—Sanguisorba* ass.:
Single (A. 85).

In *Carex—Sanguisorba*—Moss ass.:
Single (A. 181); Sparse (A. 221).

In *Betula Ermani—Filipendula—Dryopteris* ass.:
Single (A. 62, A. 64, A. 196, A. 197).
In *Betula Ermani—Filipendula—Equisetum hiemale* ass.:
Single (A. 90).

In South Kamtchatka *A. genuflexa* is fairly common. It occurs in *Filipendula* thickets, especially in their borders, in wet meadows and in transitional associations between *Filipendula* thickets and meadows. It belongs to those plants which first occupy dry gravel-banks along the rivers. It very often does not flower and occurs in the *Betula* forests as a small sterile plant which cannot be determined with certainty, but which can hardly belong to any of the other Umbelliferae in the area. It flowers in August and ripe fruits are rarely found before September. The flowers are constantly pink, which is not always evident in dry specimens. Thus Fr. Schmidt described his *A. refracta*, which is identical with our plant, as having white flowers. Fr. Schmidt described his *A. refracta* from specimens from Saghalin. The Asiatic plant has since gone under that name. (Cfr. Franch. & Sav. Enumer. Pl. Jap. I p. 187, Yabe, Rev. Umbellif. Jap. p. 76.) However, they in no way differ from the American *A. genuflexa*, of which I have seen specimens enumerated by Coulter & Rose in Monogr. N. Amer. Umbellif. p. 156. The carpels are comparatively characteristic, emarginate at the base and apex, with broadly winged lateral ribs and only one oil-tube in the intervals. The sometimes reflexed leaflets and the involucels are also so characteristic that there can hardly be any doubt about the identity of the Asiatic and American plant. The Kamtchadal name was, acc. to Steller, »Kutachschu», and a decoction of the plant was much used as a medicine by the old Kamtchadals (compare Steller, Beschreib. Lande Kamtsch. p. 88).

Type of distribution: Northern Pacific.

Geographical area: Asia: from central Kamtchatka southwards over Saghalin and Yezo to Honshu. America: from the S.W. coast of Alaska southwards along the coast to Oregon.

595. ***Angelica ursina*** (Rupr.) Benth. & Hook., Gen. Plant. I (1862) p. 616.

Kom., Voy. Kamtch. pp. 137, 412, 453 et Fl. Penins. Kamtsch. I p. 331; Hultén in Sv. Bot. Tidskr. 22 (1928) p. 225 in nota. — *Angelica* spec. Kittlitz, Weg. Ansicht. Küstenl. Stille Oc. tab. 22. — »*Medwedshie Koren*» Kittlitz, Denkw. II pp. 363, 409. — *Angelophyllum ursinum* Rupr., Rev. Umb. Kamtsch. p. 8; Ditmar, Reisen II p. 97 in nota. — »*Angelica*» Ditmar, Reisen I pp. 606, 624, 650, 651.

South Kamtchatka: About 5 km. S. of Golygina village noted by Hn; lower Golygina R. on the northern bank noted by Hn; »Topik Klutch» R. near Topik noted by Hn; (not seen at Savan R.); the mouth of Artemjeva R. in *Betula* forest noted by Hn; upper Kovach R. (the lava-stream »Kovachinski kameni mys») noted by Hn; upper Udoshk R. W. of Opala noted by Hn; (not found on the pass between Udoshk and Abshen rivers); lower Abshen R.

first flower of the season July 17th 1921 noted by Hn; lower Karymchina R. noted in A. 124, A. 151; middle Karymchina R. to about 220 m. noted by Hn; (not found at lower Tolmachovaja R. between No. 83 and 74 on the map in part I pl. I); Agashka R. noted in A. 65; Danilina R. noted in A. 61; lower Ipelka R. common on large fields noted by Hn; S.E. of Bolsheredsk noted in A. 56; Bolsheredsk Rubinski, do. Aug. 22nd 1921 Hn No. 2903, do. June 13th 1922 Hn No. 3792; between Bolsheredsk and Apatcha Rieder 1833, do. Komarov 1908, do. noted in A. 113; Apatcha Komarov 1908; between Apatcha and Siku noted in A. 150; the hot springs at Siku R. noted in A. 122; lower Bannaja R. noted by Hn; mt. »Malaja Shreptik» Bannaja Komarov 1908; near Mt. Stoll between Apatcha and Natchika (isolated spot, only sterile specimens) noted by Hn; half way between Apatcha and Malka acc. to Kittlitz loc. cit.

West and North Kamtchatka: Between Bolsheredsk and Utka acc. to Ditmar loc. cit. p. 651; Utka Rubinski 1908; between Utka and Kichtchik acc. to Ditmar loc. cit.; Chamutchina R. Vossnesensky acc. to Rupr. loc. cit.; Sopotchnaja acc. to Ditmar loc. cit. p. 624.



Fig. 17. Cross-section of the carpel of *Angelica ursina*. Enlarged 10: 1.

»Kamtchatka»: Collector unknown sub »*Imperatoria?*» (Hb. Acad. Petrop.), Rieder, Dybovsky 1879.

Noted in the following associations:

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Scattered (A. 56, A. 61, A. 151); Abundant (A. 113, A. 122, A. 124).

In *Betula Ermani—Thalictrum—Carex* ass.:
Abundant (A. 150).

In *Alnus hirsuta—Filipendula—Dryopteris* ass.:
Scattered (A. 65).

This striking plant occurs only along the western shore of Kamtchatka northwards to Sopotchnaja (acc. to Ditmar). It covers large areas along the valleys of the rivers and these *Angelica ursina*-meadows present a very peculiar appearance. The specimens are very regularly placed at a certain distance from one another and the leaves form an even stratum about 2 m. above the ground over which the regularly-placed flowering stems protrude. Such meadows are especially abundant around Bolsheredsk. In the *Betula* forests our plant occurs more scattered, with high but less thick stems. *A. ursina* flowers from the middle of July to the end of August and the fruits are ripe in the middle of September. The plant is a hapaxanth, needing at least three years for its development. Its flowering stems are about 3,5 m. high. A specimen measured

at Agashka R. was 343 cm. high and the stem was 21,5 cm. in circumference (= 6,8 cm. in diameter) at the base. RUPRECHT, informed by VOSSNESENSKY, says that the largest specimens had stems 3 vershok (= 13,3 cm.) in diameter and 2 sachen (= 4,26 m.) in height up to the base of the umbel. The large, strongly dissected leaves have the outline of an equilateral triangle (each side about 2,25 m. on a fully grown leaf). Only the central umbel produces ripe seeds, the lateral ones (of the first, second and often the third order) having well-developed anthers, but small and undeveloped ovaries. (Compare Pl. III.) In the spring the dead stems of the previous year are usually still in their places, but during the summer they rot at the base and fall off. The new stems develop in June from buds enclosed in large sheaths and of the size of a child's head.

The root is very thick and large and contains some aromatic substance. It is used as a medicine. The Kamtchatka name for the plant is »Medvjedschie koren» (= bear-root). RUPRECHT placed our plant in a separate genus — *Angelophyllum* — on the strength of the broad commissure and the adpressed margins of the mericarps, while REGEL (Acta Horti Petrop. V, (1878) p. 590) placed it in the section *Euangelica* of the genus *Angelica*. A cross-section of the carpel from material preserved in formaline is given in fig. 17.

Type of distribution: Asiatic Pacific.

Geographical area: S.W. Kamtchatka, Saghalin, Yezo (except S.E. part), northern and central Honshu.

Phellopterus litoralis (A. GRAY) BENTH.

YABE & YENDO, Fl. Shimushu p. (189).

In YABE & YENDO loc. cit., where this plant is reported from Shumshu, it is marked with a star. The significance of this sign is not given in the paper, but it seems to indicate those plants that are cited from literature only. As ISHIKAWA 1894 is given as the collector, the report is probably taken from ISHIKAWA & YOKOYAMA, Report on the Geological and Mineralogical Survey of Hokkaido (1894) (in Japanese, not seen). As anyone who is not a botanist might possibly mistake *Ligusticum scoticum*, which is common on the shores of Shumshu, for *Phellopteris litoralis*, I think that the report needs confirmation. *P. litoralis* is, however, found as close as in the southern Kuriles and in Saghalin and might of course easily grow somewhat further to the north. It is not reported from Shumshu in MATSUMURA, Index Pl. Jap., but KUDO (1925) p. 271 gives it in the table from the northern Kuriles.

596. ***Heracleum lanatum*** MICHX., Fl. Bor. Amer. I (1803) p. 166.

MAXIM. in Bull. Soc. Nat. Mosc. 54: 1 (1879) p. 24 (»forma minus pubescens»); COULTER & ROSE in Contr. U. S. Nat. Herb. VII: 1 (1900) p. 248; FEDTSCH., Fl. Îl. Comm. p. 65; KOM., Voy. Kamtch. p. 451; KUDO, Fl. Paramush. p. 139. — »*Heracleum*» KRASCHENINN., Kamtsch. p. 103. — *Heracleo Sphondylio affinis* PALLAS in Stralsund. Mag. II (1768) p. 170. — ?*Sphondylium* PALLAS in Stralsund. Mag.

V (1769) p. 410[1]. — »*Heracleum foliolis pinnatifidis*. . .» GMEL., Fl. Sib. I p. 213 quoad pl. Kamtsch. — *Heracleum panaces* GEORGI, Beschreib. Russ. Reich III: 4 p. 849 quoad pl. Kamtsch.; PENNANT, Arct. Zool. (1784) p. CXV; LEDEB., Fl. Ross. II p. 323 quoad pl. Kamtsch. — *Heracleum sibiricum* GEORGI, Beschreib. III: 4 p.

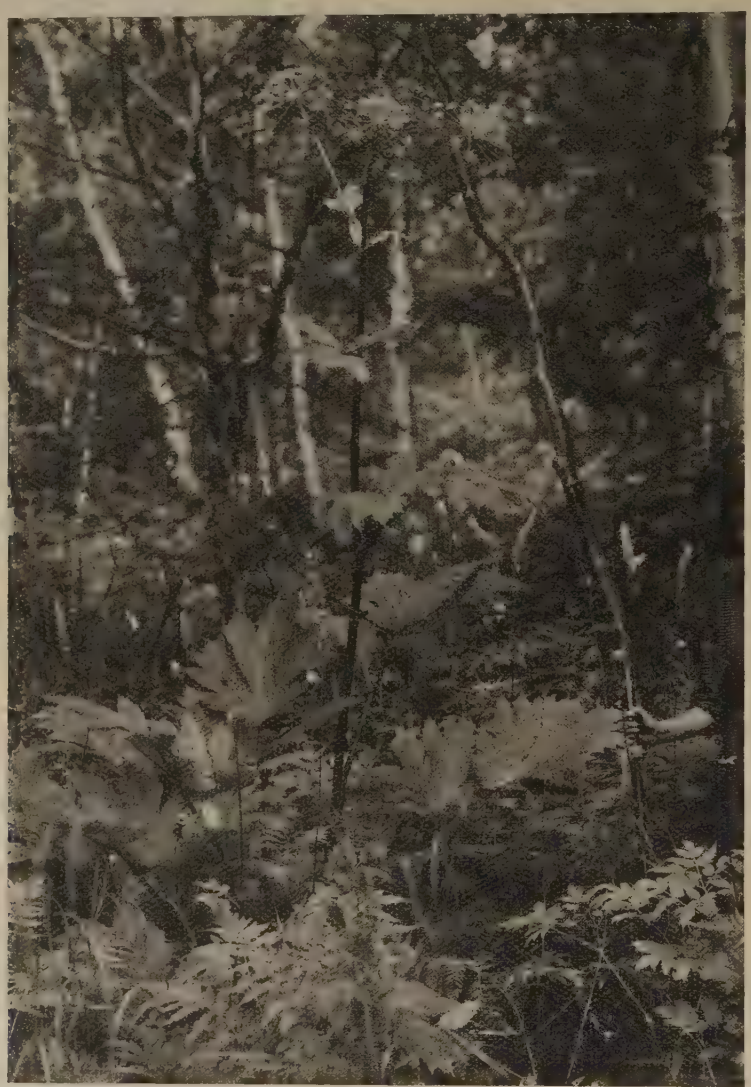


Fig. 18. *Heracleum lanatum.* Photograph from the *Betula Ermani* forest between Petropavlovsk and Avatcha volcano.

848. — »*Heracleum Sphondylium* LINN.?» HOOK. & ARNOTT in Beechy's Voy. p. 115; LEDEB., Fl. Ross. II p. 321 quoad. pl. Kamtsch. —*Heracleum dulce* FISCH. in Ind.

[1] KOMAROV in Mem. S. Ussuri Br. Russ. Geogr. Soc. II (1928) suggests that the plant in question was *Angelica ursina.* Against this assumption speaks that the plant is said to grow all over Kamtchatka (while *A. ursina* only grows on the western shore) and that it was called »Slatka trawa» which name now is used for *Heracleum lanatum.* Compare SPASSKI in Sibirski Vjestnik 1823 No. 4, p. 174—178.

Sem. Hort. Petrop. IX Suppl. (1844) p. 23[1]; KITTLITZ, Denkw. II p. 244; RUPR., Rev. Umbellif. Kamtsch. p. 19; DITMAR, Reisen I pp. 108, 448 (»*Heracleum*» pp. 423, 552, 578, 764) et Reisen II pp. 85, 96, 102; KOM. Voy. Kamtch. pp. 412, 454 et Fl. Penins. Kamtsch. I p. 331.

Northern Kuriles: Paramushir C. TARO 1892 acc. to KUDO loc. cit., KUDO 1920.

South Kamtchatka: Cape Lopatka W. Coast June 24th 1920 HN No. 135; Kurile Lake Aug. 27th 1922 HN No. 4427; lower Ozernaja R. in meadow noted by HN; middle Kusetenék R. noted in A. 194; middle Kusingen R. in meadow noted by HN; upper Ksudach R. 125 m. Aug. 4th 1921 HN No. 2658 (A. 83); upper Shadutka R. in meadow noted by HN; between the mouths of Golygina and Opala rivers in *Epilobium angustifolium—Geranium—Majanthemum* ass. noted by HN; Lake Sterbot Sept. 12th 1922 HN No. 4571 (A. 215); Assatcha mts. 600 m. Aug. 10th 1922 HN No. 4196; between Topik and Savan R. in *Betula* forest noted by HN; the hot springs at upper Opala R. Aug. 2nd 1922 HN No. 4122; Akhomten Bay 250 m. Sept. 4th 1922 HN No. 1191 b; middle and lower Tolmachovaja R. noted by HN; upper Abshen R. noted by HN; middle Karymchina R. in meadow noted by HN; Agashka R. noted in A. 65; between the mouths of Opala and Bolshaja rivers here and there in *Epilobium angustifolium—Geranium—Majanthemum* ass. noted by HN; the Kohelok Mt. 660 m. noted by HN; 10 km. W. of Bolsheredsk Aug. 26th 1921 HN No. 2962; between Bolsheredsk and Apatcha in *Angelica ursina* meadow noted by HN; Apatcha in meadow noted by HN; the Paratunka valley acc. to KOM. loc. cit.; the mouth of Paratunka R. Aug. 11th 1920 HN No. 835; Mt. Saraj, Shalsan valley KOMAROV 1908; Natchika R. RUBINSKI 1909; between Natchika and Korjaka acc. to DITMAR loc. cit. p. 447; Korjaka VOSSNESENSKY Aug. 11th 1848; between Avatcha and Savoiko acc. to DITMAR loc. cit. p. 133; Savoiko July 16th 1928 W. EYERDAM.

East Kamtchatka: Petropavlovsk MERTENS, do. 165 m. Aug. 16th 1920 HN No. 944; between Petropavlovsk and Avatcha volcano noted in A. 17; Avatcha volcano 800 m. July 31st 1920 HN No. 667; Semjatchik acc. to DITMAR loc. cit. p. 764; Ilkinoj R. KOMAROV 1909; »the second Kronoki R.» KOMAROV 1909.

Commander Islands: Bering Island STELLER and KJELLMAN acc. to FEDTSCH. loc. cit., MACOUN Sept. 1st 1891 acc. to COULTER & ROSE loc. cit., STEJNEGER 1897 and MOROZEVICZ 1903 acc. to FEDTSCH. loc. cit.; Copper Island DYBOVSKY 1879.

[1] Although *H. dulce* was described on the basis of specimens grown up in Hort. Petrop. from seeds which are supposed to have been collected in Kamtchatka, several of the most important characteristics of that species do not at all agree with the Kamtchatka plant and I think that it is doubtful whether those seeds were collected in Kamtchatka. On the other hand, FISCHER says that his species is also found at Sitcha, from which locality no *Heracleum* species is known other than *H. lanatum*.

Central Kamtchatka: The Natchika Pass Komarov 1909; Ganala acc. to Kom. loc. cit.; between Vershne Kamtchatsk and Milkova acc. to Ditmar loc. cit. p. 423; Klutchi, Thuchovka mts. Bezais 1908.

West and North Kamtchatka: Tigil acc. to Ditmar loc. cit.; Kachtana acc. to Ditmar loc. cit.; Karaginsk Island Gudzenko 1910.

»Kamtchatka»: Kusmischeff, Mertens.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.;
Sparse (A. 83).

In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 17).

In *Alnus hirsuta—Filipendula—Dryopteris* ass.:
Single (A. 65, A. 194).

In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Single (A. 215).

In South Kamtchatka *H. lanatum* is a fairly common plant, occurring scattered here and there in the lowland meadows and their transitional associations to *Filipendula* thickets, in the sub-alpine meadows and the *Betula* forests. It is a stout plant which always has ternate leaves. One specimen, which was photographed (fig. 18), was measured and proved to be 2,73 m. high. The circumference of the stem at the base was 9,5 cm., the height of the root-leaf was 1,34 m. and the diameter of the central umbel 36 cm. The leaves are hairy on the chief veins of the underside and also on the larger of the anastomating veins between them, while the smallest veins, as well as the surfaces between them, are glabrous. The fruit is suborbicular or slightly pear-shaped, with club-shaped oil-tubes, the median ones reaching slightly below the middle of the mericarps, the lateral ones usually being shorter. The ovaries are hairy but the ripe fruits practically glabrous. Even Ruprecht loc. cit. associated our plant with those from W. America, and Maximovicz loc. cit. says that they differ from American specimens only in being somewhat more glabrous, while Japanese specimens are completely glabrous. *H. barbatum* differs from our plant in its five-lobed leaves. Possibly our plant might be taken as a more glabrous variety of *H. lanatum*, but it would be necessary to study a larger amount of American material to determine that point.

The Kamtchatka name for our plant is »Sladkaja trava» (= sweet grass), the old Kamtschadal name acc. to Ruprecht »Utschkui». Formerly an alcoholic drink was manufactured from its stems.

Type of distribution: American, transgressing into Eastern Asia.

Geographical area: Asia: Kamtchatka, other reports doubtful. America: from Alaska to Newfoundland, southwards to California, Colorado, Tennessee and N. Carolina.

Cornaceae Link.

Cornus alba L.

Pallas, Fl. Ross. I p. 51; Georgi, Beschreib. III: 4 p. 740. — *Cornus sibirica* C. A. Meyer in Mém. Ac. Petrop. Sér. VI Sc. Nat. V (1849) Bot. p. 206; Wangerin in Engler, Pflanzenr. IV: 229 (Heft 41) p. 53.

In his manuscript on a Kamtchatka flora Maximovicz reports this species thus: »Kamtchatka Merk. in Hb. Pallas et secundum C. A. Meyer». All the reports of this species from our area are apparently founded on that specimen of Merk.

The plant should be excluded from the flora of our area.

597. *Cornus canadensis* L., Sp. pl. ed. I (1753) p. 118.

Komarov in Acta Horti Petrop. XXV (1905) p. 181; Palibin in Acta Horti Bot. Jurjev 9 (1908) p. 94; Kudo, Fl. Paramush. p. 140.

Northern Kuriles: Paramushir Kudo 1920 acc. to Kudo loc. cit.

Commander Islands: Copper Island Dybovsky acc. to Maxim., Manuscr.

»Kamtchatka»: »Kamtschatka et insulis» Merk. in Hb. Fisch. acc. to Maxim. Manuscr.

This plant is also reported from Tigil by Palibin loc. cit. as collected by Bogdanovitsch in September 1897. As specimens of *C. suecica* collected by Bogdanovitsch at Tigil are to be found in Hb. Hort. Petrop. and as furthermore *C. canadensis* is not even known so far northwards as Ochotsk on the western side of the Ochotsk sea, it thus can hardly be expected in northern Kamtchatka, I think that Palibins report must, until otherwise proved, be regarded as doubtful.

This species might very well be expected to occur in South Kamtchatka. This was evident to me during my field-work there, but I did not find it, although I particularly examined all *Cornus* specimens that came in my way.

Type of distribution: American transgressing into Eastern Asia.

Geographical area: Asia: from Ajan, Saghalin and the northern Kuriles southwards to northern Corea and central Honshu. America: from the Aleutian Islands and the Yukon valley to Labrador, southwards to California, New Mexico, and New Jersey. Also in southernmost Greenland.

598. *Cornus suecica* L., Sp. pl. ed. I (1753) p. 118.

Pennant, Arct. Zool. (1784) p. CXIV; Georgi, Beschreib. III: 4 p. 741; Mertens, Bemerk. Fl. Koragins p. 62; Cham. & Schlecht. in Linnaea III (1828) p. 138; Cham., Reise u. d. Welt p. 347; Erman, Verzeichn. p. 61; Hook. & Arnott in Beechy's Voy. p. 115; Ledeb., Fl. Ross. II p. 377; Yabe & Yendo, Fl. Shimushu p. (189); Fedtsch., Fl. Îl. Comm. p. 66; Koidz. Pl. Yokoyam. p. 214; Wangerin in Engler, Pflanzenreich IV: 229 (Heft 41) p. 81; Kom., Voy. Kamtch. pp. 70, 86, 101, 200, 205, 414, 452 et Fl. Penins. Kamtsch. I p. 332; Kudo,

Fl. Paramush. p. 139; MALAISE, Jakter och Jordbävn. p. 99. — »*Cornus herbacea, ramis binis . . .*» GMEL., Fl. Sib. III p. 163. — *Cornus herbacea* STELLER in PALLAS, Neue Nord. Beytr. II (1781) p. 300; PALLAS, Fl. Ross. I p. 52.

Northern Kuriles: Paramushir C. TARO 1892, S. YOKOYAMA 1893 both acc. to KUDO loc. cit., KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka, west coast June 19th 1920 HN No. 66; N. of Ozernaja village in heath noted by HN; near Javina RUBINSKI 1909; between Javina and Kochegochek noted by HN; S. of Kochegochek noted in A. 213; between Kochegochek and Golygina noted in A. 102; lower Golygina R. in heath noted by HN; Golygina village noted by HN; between the mouths of Golygina and Opala rivers noted by HN; N. of Opala village noted in A. 214; the northern slope of Assatcha mts. 650 m. noted by HN; Lake Kambolnoje noted in A. 218; the mouth of Artemjeva R. in the margin of a *Sphagnum*-bog noted by HN; lower Tolmachovaja R. in heath noted by HN; Zykovaja noted in A. 217; N.E. of the mouth of Bolshaja R. noted in A. 104; near the mouth of Bolshaja R. noted by HN; lower Karymchina R. in the margin of a bog noted by HN; Ipelka R. in the margin of a bog noted by HN; Bolsheredsk BEZAIS 1909; S. of Bolsheredsk in the margin of a bog noted by HN; Apatcha KOMAROV 1908 (Hb. Berol.); Bannaja R. RUBINSKI 1908; between Paratunka and Mikisha KOMAROV 1908; Lake Dalni KOMAROV 1908; Tarja Bay KOMAROV 1908; Bogotyrjovka July 16th 1920 HN No. 450; Shalsan R., near Mt. Stoll in *Pinus pumila* thickets noted by HN; between Avatcha and Sierroglaska RUBINSKI 1908; Mt. Shtchapotchka, Natchika KOMAROV 1908; Mt. Palovinaja 700 m. Savoiko July 8th 1920 HN No. 301; Poperochnaja R. acc. to KOM. loc. cit.; Lake Ovalni KOMAROV 1908.

East Kamtchatka: Petropavlovsk STEWART, do. MERTENS, do. DYBOVSKY 1879, do. GUDZENKO 1910, do. PERFILJEF 1910, do. Aug. 14th 1920 HN No. 871, do. June 14th 1921 HN No. 1690; the Kalashtyrka valley PERFILJEF 1910; Cape Kozlov acc. to MALAISE loc. cit.; Ustj-Kamtchatsk AFANASEJEV 1908.

Commander Island: Bering Island: STELLER acc. to STELLER loc. cit., KJELLMAN, DYBOVSKY 1879, GREBNITZKY 1894 and acc. to FEDTSCH. loc. cit. STEJNEGER; Copper Island DOBROTVORSKY 1881 and acc. to FEDTSCH. loc. cit. STEJNEGER, DYBOVSKY, GREBNITZKY, TILMAN and MOROZEVICZ.

Central Kamtchatka: Mt. Zerkalo, Malka PROTOPOPOF 1908; between Malka and Ganala acc. to KOM. loc. cit.; the Ganala »tundra» acc. to KOM. loc. cit.; Kamtchatka Vershina acc. to KOM. loc. cit.; Pushtchina KOMAROV 1909 (Hb. Berol.).

West and North Kamtchatka: Chairusovaja NOVIKOF 1909; Tigil LEVITZKY 1848, do. GUDZENKO 1910; between Tigil and the harbour »Ad ERMAN Hb. CHAM.»; Tigil on the sea-shore BOGDANOVITSCH 1895—98; Pallan SAVTCHENKO 1911; Karaginsk Island MERTENS, do. LOGINOVSKI.

»Kamtchatka»: KRASCHENINNIKOF acc. to GMEL. loc. cit., CHAMISSO (Hb. Berol.), ESCHSCHOLTZ, CHORIS, STEWART, KASTALSKY, KUSMISCHEFF, MER-

TENS, »FISCHER misit 1829» (Hb. Berol.), ERMAN 1840 (Hb. Berol.), RIEDER, »Capit. WERNGREN» Hb. Holm.

Noted in the following associations:

In *Vaccinium—Empetrum*—Moss ass.:
Sparse (A. 218); Scattered (A. 104); Abundant (A. 214).

In *Vaccinium—Empetrum*—Lichen ass.:
Sparse (A. 102); Abundant (A. 213).

In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Sparse (A. 217).

In South Kamtchatka *C. suecica* is common along the western shore, occurring in the heaths, in the subalpine meadows and in the margin-belt of the bogs chiefly consisting of *Carex—Rubus chamaemorus—Vaccinium—Empetrum* ass. Inland it is more rare, sometimes occurring along the margin of the *Pinus pumila* thickets and in the above-mentioned *Rubus chamaemorus* association.

In Veröff. Geobot. Inst. RÜBEL, Zürich (1927) Heft 4 p. 103 REGEL gives an account of the »*Cornus suecica*-associationen» of Europe. He there (p. 121) cites KOMAROV — who (loc. cit. p. 414) says that *C. suecica* in Kamtchatka is characteristic of the *Betula* forests — and draws the conclusion that *Cornus*-rich *Betula* forests corresponding to those of northern Europe also exist in Kamtchatka, although the forest is formed by another *Betula* species. This is hardly correct. If we realize that *Betula Ermani* does not form such low open subalpine forests as *B. tortuosa* in the mts. of northern Europe, but usually retains its high growth and characteristic subvegetation up to its alpine limit, it seems hardly natural that an association corresponding to REGELS »*Betuletum chamaemoroso-cornosum*» (loc. cit., p. 111) should occur there.

C. suecica has a very peculiar geographical distribution. It occupies two quite distinct areas, one around the shores of the northern Atlantic Ocean and one around the shores of the northern Pacific Ocean. I am not able to determine whether any given specimen has grown within the one or the other of these areas. The plant is more rare inland as well in Scandinavia, Finland and Russia as in Kamtchatka.

Type of distribution: Bicentric, Northern Atlantic and Northern Pacific.

Geographical area: The Atlantic area: Europe: from Iceland, northernmost Scandinavia, Kola Penins. and Kanin Penins. to Kolgujef and Timan mts. (W. of Petshora), southwards to Scotland, E. England, E. Friesland, Schleswig-Holstein, Pomerania (one locality), northern Esthonia and northern Vologda prov. America: from Labrador 52° N. lat. southwards to 47° N. lat. westward to the shores of St. Lawrence Bay. E. and W. Greenland to about 66° N. lat. The Pacific area: Asia: from Bering Straits southwards in the coast-region to South Ussuri (Olga Bay), Saghalin and northern Yezo. America: Alaska from about 67° N. lat. southwards in the coast-region to about 52° N. lat.

Explanation of plates.

The specimens illustrated here (except *Chrysosplenium rimosum*) belong to the Swedish State Museum of Natural History, Stockholm. The photographs reproduced were taken by myself.

Plate 1.

a, b, c. *Saxifraga bracteata* DON. The specimen reproduced is HN No. 804. (About half natural size.)
d. *Chrysosplenium rimosum* KOM. Type specimen. (Somewhat more than half natural size.)
e. *Chrysosplenium* cfr. *rimosum* MALAISE No. 170. (Somewhat more than half natural size.)
f, g. *Viola avatschensis* BCKR. & HULTÉN, d. Type specimen HN No. 582 a. e. HN No. 3911. (About half natural size.)
h. *Viola crassicornis* BCKR. & HULTÉN. Type specimen HN No. 1649. (About half natural size.)
i, j. *Bupleurum triradiatum* ADAMS subsp. *alpinum*. The specimen reproduced is HN No. 2336. (Somewhat more than half natural size.)

Plate 2.

a. *Oxytropis erecta* KOM. The specimen reproduced is HN No. 572.
b. *Oxytropis litoralis* KOM. The specimen reproduced is MALAISE No. 483.
c, d. *Oxytropis kamtschatica* HULTÉN. Type specimen, HN No. 570 a.
e, f. *Oxytropis rubricaudex* HULTÉN. Type specimen, HN No. 95 a.
(All about half natural size.)

Plate 3.

Angelica ursina. Photograph from a meadow between Bolsheredsk and Apatcha. The difference between the fruiting central umbel and the surrounding male umbels is clearly seen.



460. *Drosera anglica*



461. *Drosera rotundifolia*



462. *Sedum Aizoon subsp. kamtschaticum*



463. *Sedum roseum*



464. *Sedum Telephium var. purpureum*



465. *Sedum verticillatum*



466. *Saxifraga bracteata*



467. ● *Saxifraga bronchialis subsp. Funstonii* and ◉ *subsp. spinulosa*



468. *Saxifraga cernua*



469. *Saxifraga davurica*



470. *Saxifraga flagellaris*



471. *Saxifraga foliolosa*



472. *Saxifraga fusca*



473. *Saxifraga hieracifolia*



474. *Saxifraga hirculus*



475. *Saxifraga Merkii*



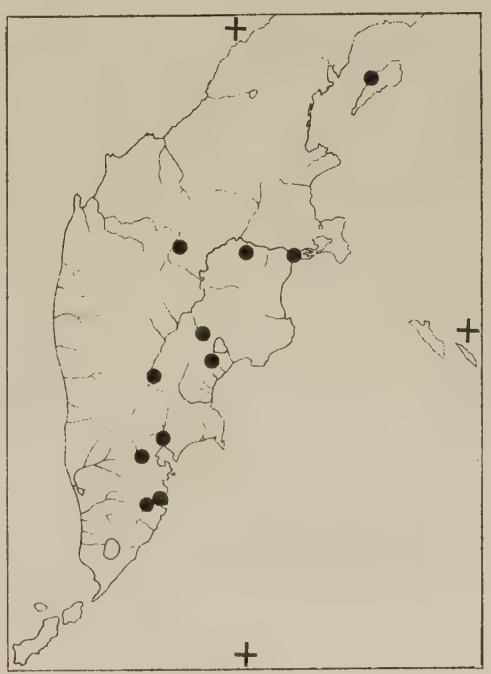
476. *Saxifraga nivalis*



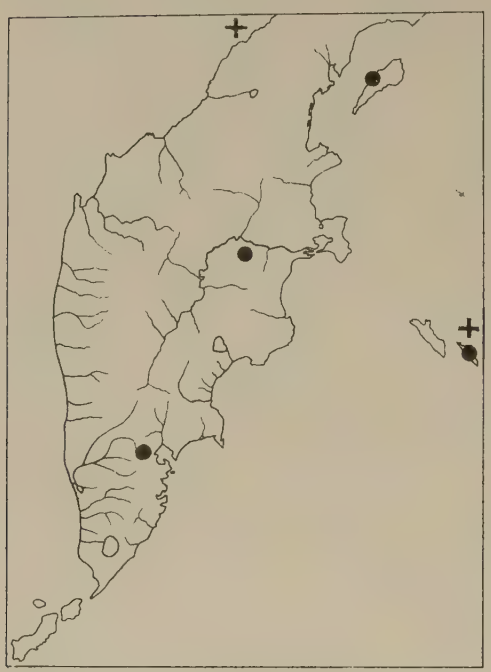
477. *Saxifraga oppositifolia subsp. asiatica*



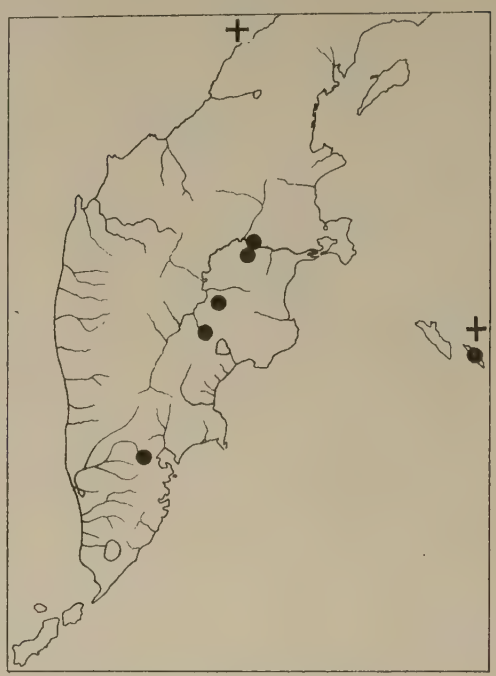
478. *Saxifraga punctata*



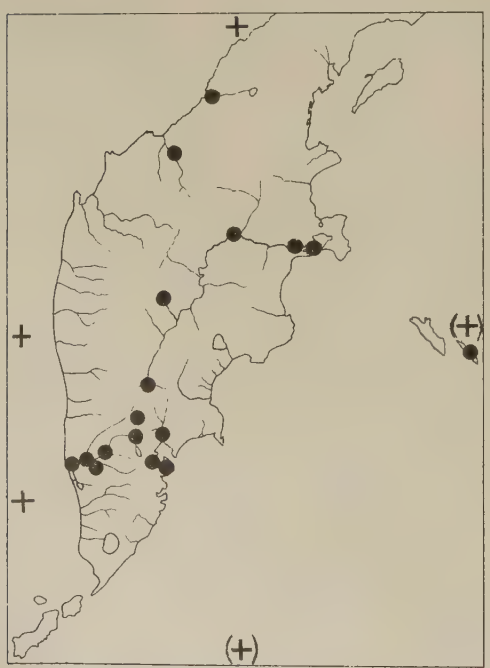
479. *Saxifraga rivularis var. flexuosa*



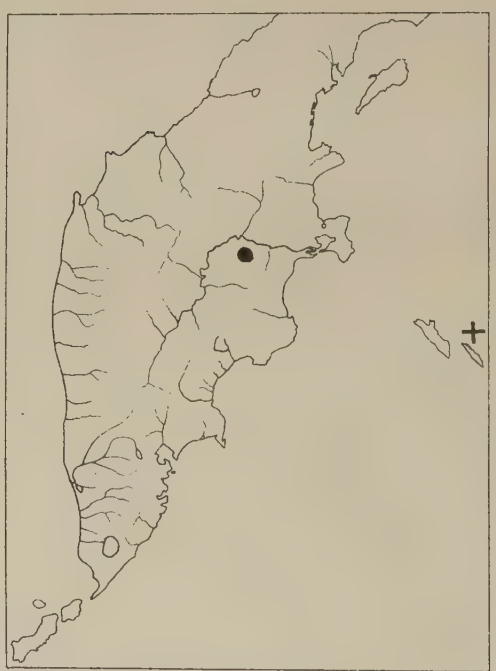
480. *Saxifraga serpyllifolia*



481. *Saxifraga unalaschkensis*



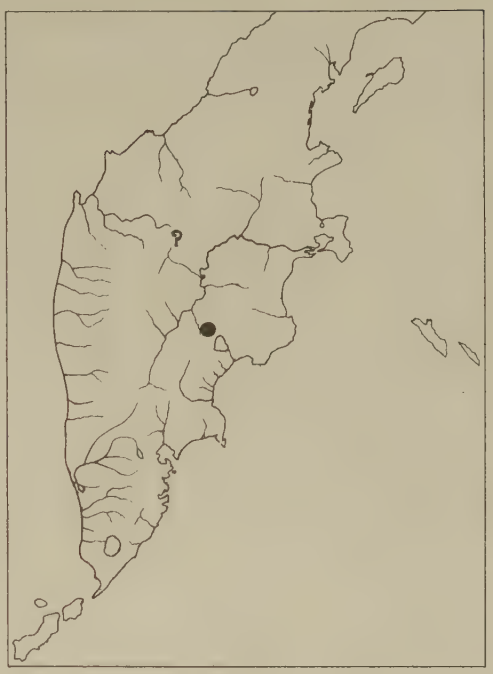
482. *Chrysosplenium alternifolium*



483. *Chrysosplenium Beringianum*



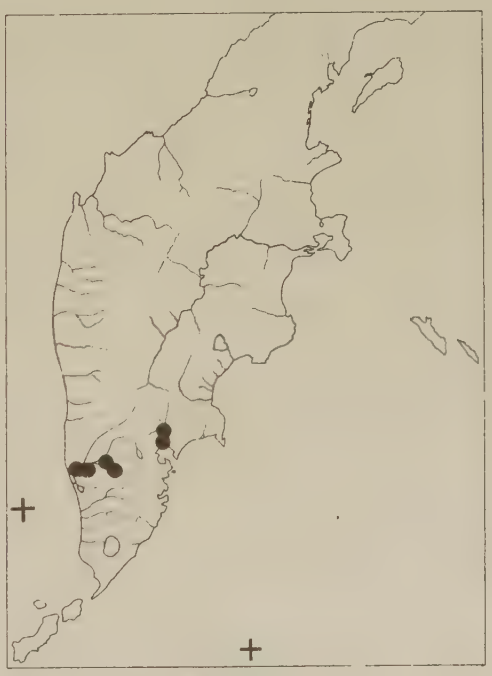
484. *Chrysosplenium kamtschaticum*



485. *Chrysosplenium rimosum*



486. *Parnassia palustris*



487. *Ribes latifolium*



488. *Ribes triste*



489. *Spiræa Beauverdiana*



490. *Spiræa media*



491. *Spiræa salicifolia*



492. *Aruncus sylvester*



493. *Sorbaria sorbifolia*



494. *Sorbus kamtschatcensis*



495. *Sorbus sambucifolia*



496. *Crataegus chlorosarca*



497. *Rubus arcticus*



498. *Rubus chamaemorus*



499. *Rubus idæus subsp. sachalinensis*



500. *Rubus stellatus*



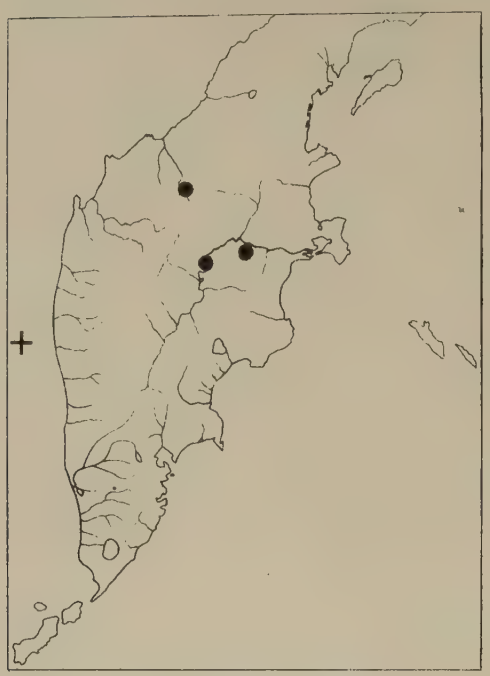
501. *Potentilla anserina*



502. ● *Potentilla fragiformis and* ○ *subsp. megalantha*



503. *Potentilla fruticosa*



504. *Potentilla multifida*



505. *Potentilla nivea*



506. *Potentilla norvegica*



507. *Potentilla pacifica*



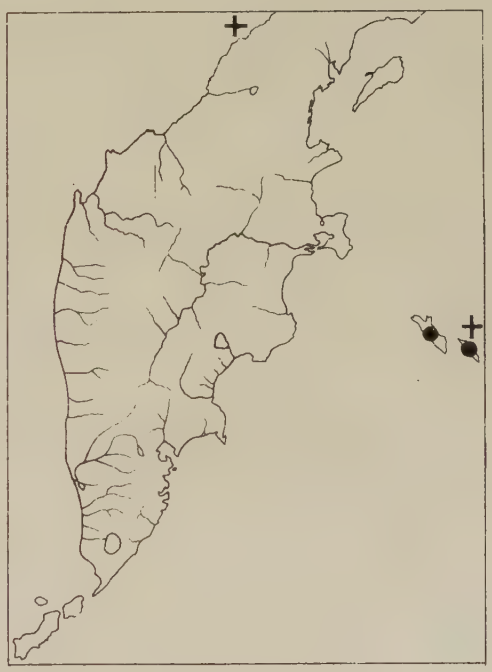
508. *Potentilla palustris*



509. *Potentilla stolonifera*



510. *Potentilla uniflora and var. ampla*



511. *Potentilla villosa*



512. *Sibbaldia procumbens*



513. *Geum glaciale*



514. *Geum macrophyllum*



515. *Geum pentapetalum*



516. *Geum Rossii*



517. *Geum rotundifolium*



518. *Geum selinifolium*



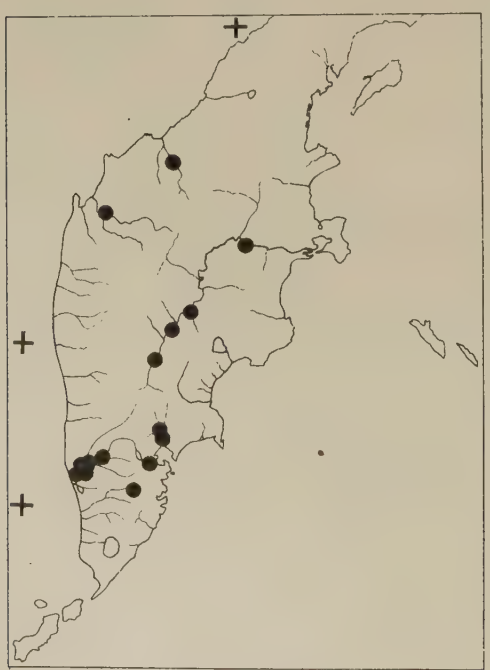
519. *Geum strictum*



520. *Dryas octopetala*



521. *Filipendula kamtschatica*



522. *Filipendula palmata*



523. ○ *Sanguisorba officinalis and* ● *S. officinalis* × *tenuifolia*



524. *Sanguisorba tenuifolia*



525. *Rosa acicularis*



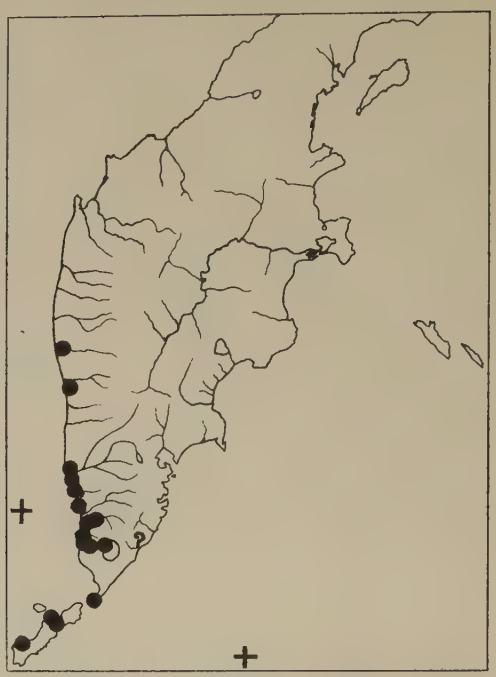
526. *Rosa davurica*



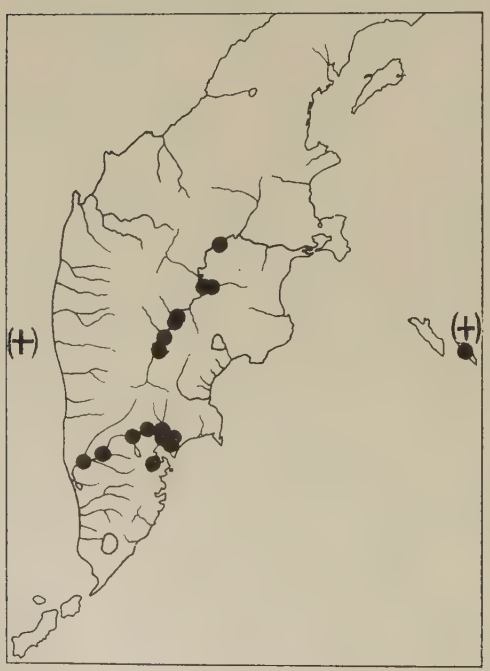
527. ● *Rosa rugosa and* ○ *R. davurica* × *rugosa*



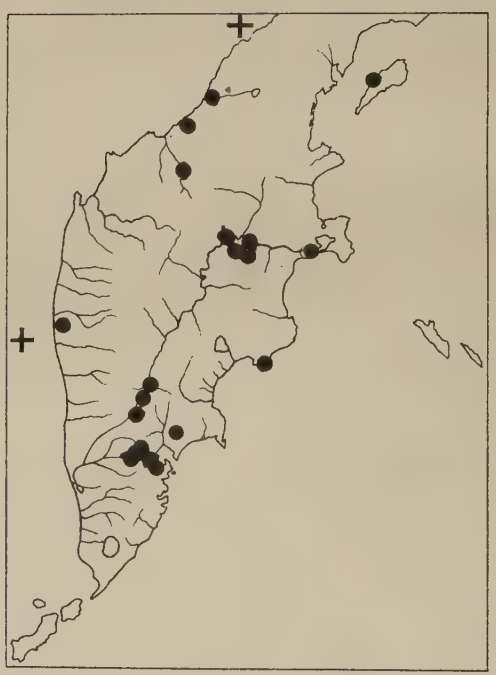
528. *Prunus Padus*



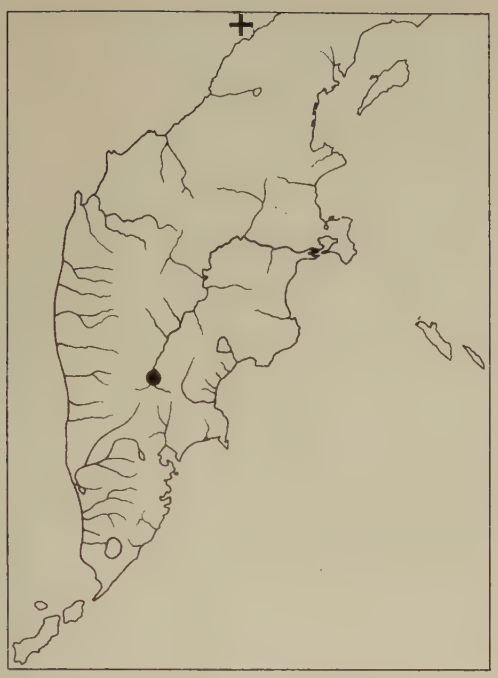
529. *Thermopsis fabacea*



530. *Trifolium repens*



531. *Astragalus alpinus*



532. *Astragalus arcticus*



533. *Astragalus frigidus subsp. parviflorus*



534. *Astragalus Schelichowii*



535. *Astragalus umbellatus*



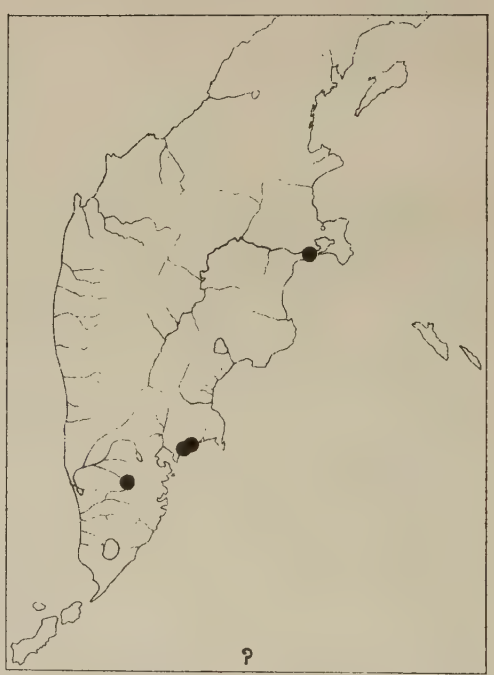
536. *Oxytropis erecta*



537. *Oxytropis kamtschatica*



538. *Oxytropis leucantha*



539. *Oxytropis litoralis*



540. *Oxytropis longipes*



541. *Oxytropis Maydelliana*



542. *Oxytropis nigrescens*



543. *Oxytropis revoluta*



544. *Oxytropis rubricaudex*



545. *Hedysarum obscurum*



546. *Vicia Cracca*



547. *Lathyrus maritimus*



548. *Lathyrus palustris var. pilosus*



549. *Geranium erianthum*



550. *Callitriche autumnalis*



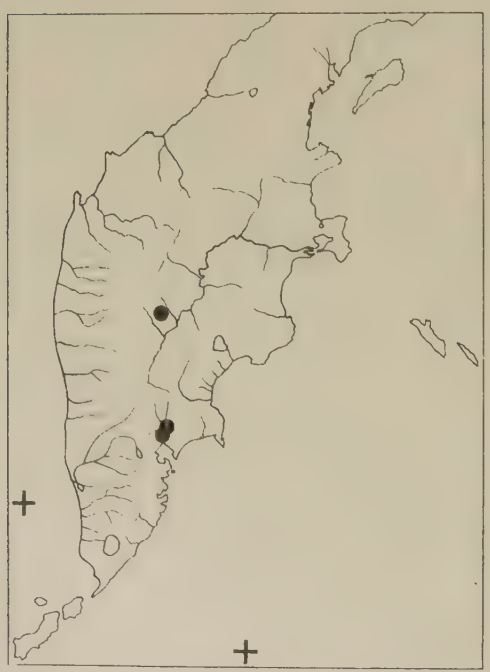
551. *Callitriche verna*



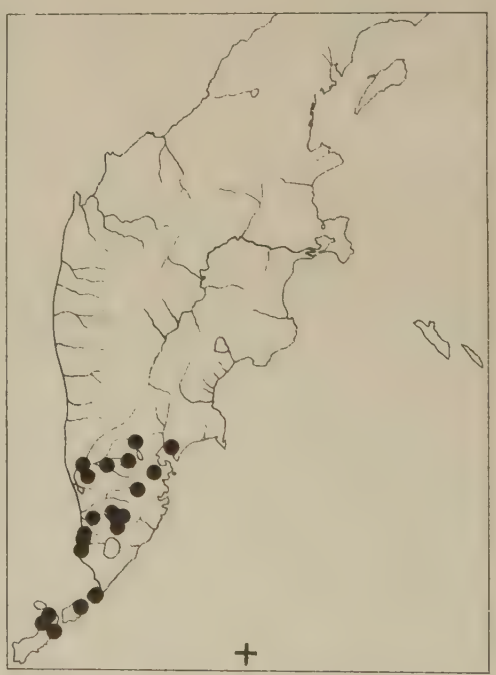
552. *Empetrum nigrum*



553. *Impatiens noli tangere*



554. *Hypericum Gebleri*



555. *Hypericum kamtschaticum*



556. *Elatine Hydropiper*



557. *Elatine triandra*



558. *Viola avatschensis*



559. *Viola biflora*



560. *Viola crassa*



561. *Viola crassicornis*



562. *Viola epipsila subsp. repens*



563. *Viola Hultenii*



564. *Viola kamtschadalorum*



565. *Viola Komarovii*



566. *Viola Langsdorffii*



567. *Viola Selkirkii*



568. *Daphne kamtschatica*



569. *Epilobium anagallidifolium*



570. *Epilobium augustifolium*



571. *Epilobium Behringianum*



572. *Epilobium davuricum*



573. *Epilobium glandulosum*



574. *Epilobium Hornemanni*



575. *Epilobium latifolium*



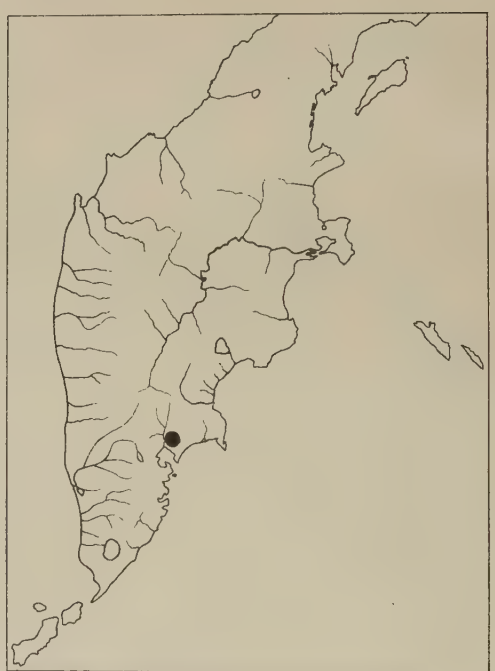
576. *Epilobium palustre*



577. *Epilobium sertulatum*



578. *Circæa alpina*



579. *Myriophyllum isoetophilum*



580. *Myriophyllum spicatum*



581. *Hippuris tetraphylla*



582. *Hippuris vulgaris*



583. *Anthriscus nemorosa*



584. *Pleurospermum uralense*



585. *Bupleurum triradiatum*



586. *Cicuta virosa*



587. *Sium cicutifolium*



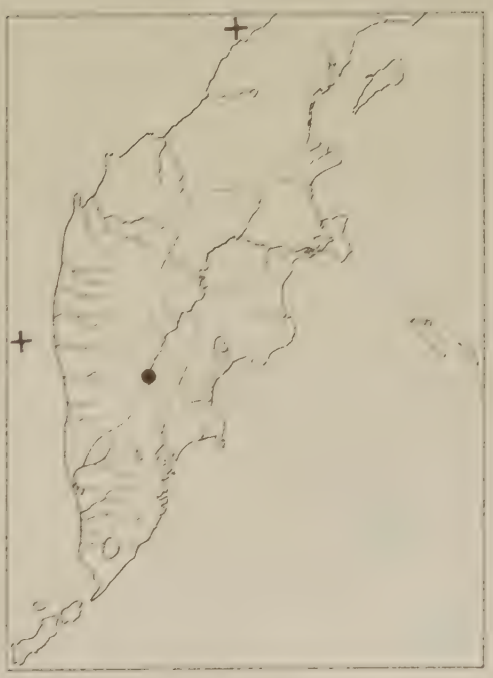
588. *Carum Carvi*



589. *Coniosselinum Gmelini*



590. *Cnidium ajanense*



591. *Ligusticum mutellinoides*



592. *Ligusticum scoticum*



593. *Coelopleurum Gmelini*



594. *Angelica genuflexa*



595. *Angelica ursina*



596. *Heracleum lanatum*



597. *Cornus canadensis*



598. *Cornus suecica*

Tryckt den 18 maj 1929.

Uppsala 1929. Almqvist & Wiksells Boktryckeri-A.-B.



A. BONNIERS TRYCKERI A.-B. STHLM



A. BONNIERS TRYCKERI A.-B. STHLM.



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Tredje Serien. Band 5 No. 1 and No. 2 and Band 8 No. 1.

Pyrolaceae Dum.

599. ***Pyrola chlorantha*** Swartz in Sv. Vet. Acad. Handl. Stockholm (1810) p. 190 tab. 5.

Kom., Voy. Kamtsch. p. 225 et Fl. Penins. Kamtsch. II p. 352.

Central Kamtchatka: Between Kirganik and Mashura Komarov 1909; Shtchapina Komarov 1909; do. July 20th 1921 Hn No. 3462 (Malaise); Malaja Nikkolki Komarov 1909; Bolshaja Nikkolki Komarov 1909; Klutchi Bezais 1908 (Hb. Berol.); about 12—15 km. E. of Klutchi in *Larex*-forest July 27th 1926 Malaise No. 414.

The specimens agree well with the Scandinavian. Our plant prefers the fir-woods and, like them, is limited to the central part of the Kamtchatka Peninsula.

Type of distribution: Circumpolar.

Geographical area: Europe: from northern Scandinavia, northern Finland, Vjatka and southern Perm southwards to Spain, central Italy, the Balkans and Caucasus. Not in Denmark, Holland, Western France, western Spain or Great Britain, nor in the Russian steppe-zone. Asia: in a narrow zone throughout Siberia (apparently rare towards the east) in southern Tobolsk, Tomsk, northern Akmolinsk and Semipalatinsk, southern Yeniseisk and Irkutsk provinces, some few localities from Transbaikalia and northern Amur prov. (Bureja R. between Nora and Mamyga rivers) and central Kamtchatka; also in Asia Minor. America: (in different variations comp. Fernald in Rhodora 22 1920 p. 49) from Mackenzie and British Columbia to Labrador and Newfoundland, southwards to California, Arizona, Illinois and Distr. of Columbia. A map of the European distribution is given by Sterner in Geogr. Annal. 1922 Pl. 22. *P. renifolia* Maxim. is sometimes taken as the counterpart of *P. chlorantha* in Manchuria and Japan, but differs distinctly in leaf-form.

600. ***Pyrola media*** Swartz in Sv. Vet. Acad. Handl. Stockholm 1804 p. 260.

South Kamtchatka: Javina Rubinski 1909 (sub *P. minor*); the divide between Savan and Shadutka rivers 250 m. Aug. 1st 1921 Hn No. 2575 a; Savoiko July 28th 1928 W. Eyerdam.

East Kamtchatka: between Petropavlovsk and Avatcha volcano 350 m. Aug. 6th 1920 Hn No. 771; do. Aug. 22nd 1920 Hn No. 1025; Avatcha vol-

cano 450 m. Aug. 5th 1920 Hn No. 747 a; the Kronoki Pass Aug. 10th 1909 Komarov.

Commander Islands: Bering Island Grebnitzky 1894 sub *P. minor*.

»Kamtchatka»: Stewart (sub *P. rotundifolia* subsp. *grandiflora* det. Nekrassova).

P. media is rare within our area. As far as I can see, Kamtchatka specimens do not differ in any important respect from Scandinavian. Andres writes (Deutsche Bot. Monatschr. XXII, 1910 p. 7) that he does not know this plant from Siberia. It is, however, reported by Krylof from Tomsk prov. and by Peintz from the Sajan mts. and I have seen specimens from southern Tobolsk and Yeniseisk provinces as well as from Saghalin which, to my mind, must be referred to *P. media*. Even in Europe it is not a common plant and the scanty reports from Siberia may be due to its being rare there. It flowers at the end of July and the beginning of August.

Type of distribution: Eurasiatic.

Geographical area: Europe: From Iceland, central Scandinavia and Finland and northern Perm, southwards to Ireland, Scotland, S.E. France, Sardinia, Montenegro, Macedonia, Minsk, Moskovsk and Ufa, with single localities further to the south in Charkov, Crimea and Caucasus. Asia: Asia Minor, southern Tobolsk prov., Tomsk prov., southern Yeniseisk prov., Saghalin, Kamtchatka and Commander Islands.

601. ***Pyrola minor*** L., Sp. pl. ed. I (1753) p. 396.

Hook. & Arnott in Beechy's Voy. p. 116; Ledeb., Fl. Ross. II p. 930; Herder, Pl. Radd. Monopet. No. 58 in Radde, Reisen IV: 1 p. 80 et Acta Horti Petrop. I: 2 (1872) p. 262; Fedtsch., Fl. Îl. Comm. p. 90 pro max. parte; Kom., Fl. Penins. Kamtsch. II p. 353.

South Kamtchatka: The western Shadutka R. in heath noted by Hn; the divide between Shadutka and Savan rivers 250 m. Aug. 1st 1921 Hn. No. 2575 b; Akhomten Bay 250 m. Sept. 11th 1920 Hn No. 1309; Mutnovskaja volcano 800 m. July 28th 1922 Hn. No. 4044; W. of Opala volcano 360 m. July 19th 1921 Hn No. 2219 and 2221; Opala volcano 1100 m. July 21st 1921 Hn No. 2280; lower Bolshaja R. noted in A. 106; Danilina R. July 14th 1921 Hn No. 2152; 10 km. W. of Bolsheredsk Aug. 23rd 1921 Hn No. 2917; Lake Natchika Komarov 1908; Poperochnaja R. Komarov 1908; Savoiko July 7th 1920 Hn No. 264; Sheljesnoj R. Komarov 1908; »Avatcha Bay» acc. to Hook. & Arnott loc. cit.

East Kamtchatka: Petropavlovsk July 10th 1928 W. Eyerdam; between Petropavlovsk and Avatcha volcano 350 m. Aug. 23rd 1920 Hn No. 1004 (A. 9); Avatcha volcano 450 m. Aug. 5th 1920 Hn No. 747 b; do. Aug. 25th 1928 W. Eyerdam; Ilkinoj R. Komarov 1909; the Kronoki Pass July 5th 1909 Komarov.

Commander Islands: Bering Island Kjellman and acc. to Fedtsch. loc. cit. Steller, Stejneger and Morozevicz (the plant collected by Greb-

NITZKY is *P. media*); Copper Island DYBOVSKY and acc. to FEDTSCH. loc. cit. TILMAN, STEJNEGER and MOROZEVICZ.

Central Kamtchatka: Ganala 1909 acc. to KOM. loc. cit.; Kashkan R. Pushtchina KOMAROV 1909 acc. to KOM. loc. cit.; Mashura KOMAROV 1909; Shtchapina KOMAROV 1909; Anauna R. Aug. 19th 1926 MALAISE No. 413, 416, 417, do. Sept. 5th 1926 MALAISE No. 418; Klutchi BEZAIS 1908, do. July 20th 1926 MALAISE No. 415.

West and North Kamtchatka: Krutugorovaja ZELENIN 1908; between Jelovka and Sedanka Aug. 20th 1927 VAVILIN.

»Kamtchatka»: ESCHSCHOLTZ, STEWART, LUBARSKY, KUSMISCHEFF, PETERS, all acc. to HERDER loc. cit.

Noted in the following association:

In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 9, A. 106).

In South Kamtchatka *P. minor* is a comparatively common plant, occurring in the *Betula* forests, but also in the mountains up to an altitude of about 1100 m. It flowers in July and the beginning of August.

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland, northernmost Scandinavia and Samoyede Land (reported also from Nova Zembla) southwards to southern Spain, Sardinia, central Italy, the northern Balkans, Crimea and central Caucasus (not in Western France or the southern Russian steppe-zone). Asia: at Yenisei from about 71° N. lat., from Vilju distr., Jakutsk distr. and northern Kamtchatka, southwards to Akmolinsk prov., northern Semipalatinsk prov., Sajan mts., Saghalin and northern Yezo; also reported from Honshu. America: from Alaska to Melville Penins., Labrador and Newfoundland, southwards to California, Colorado, Minnesota and northern New England. E. and W. Greenland to about 70° N. lat.

602. ***Pyrola rotundifolia*** L., Sp. pl. ed. I (1753) p. 396.

var. ***incarnata*** (FISCH.) DC., Prodr. VII (1839) p. 773 (»β *incarnata*»).

HERDER, Pl. Radd. Monopet. No. 54 in Acta Horti Petrop. I: 2 (1872) p. 357 et RADDE, Reisen IV: 1 p. 75. — »*Pyrola staminibus adscendentibus pistillo declinato . . .*» GMEL., Fl. Sib. IV p. 128 quoad pl. Kamtsch. — *Pyrola rotundifolia* PENNANT, Arct. Zool. (1784) p. CXV; GEORGI, Beschreib. III: 4 p. 960; ?FEDTSCH., Fl. Îl. Comm. p. 90. — *Pyrola incarnata* FISCH. ex DC., Prodr. VII (1839) p. 773; KOM., Fl. Penins. Kamtsch. II p. 351. — *Pirola rotundifolia* subsp. *rotundifolia* var. *incarnata* ANDRES in Österr. Bot. Zeitschr. LXIV (1914) p. 238.

East Kamtchatka: Klutchevskaja volcano KOZLOVSKY 1909; Ustj Kamtchatsk MALAISE 1926.

Commander Islands: ?Bering Island GREBNITZKY acc. to FEDTSCH. loc. cit.

Central Kamtchatka: Between Ganala and Pushtchina 27 verst from Ganala GRINOP 1909; Kirganik KOMAROV 1909; Mashura GRINOP 1909; Shtcha-

pina KOMAROV 1909; Kosyrevsk PROTOPOPOV 1909, do. July 9th 1921 Hx No. 3427 (MALAISE); Kosyrevsk R. May 20th 1925 MALAISE No. 498. Klutchi BEZAIS 1908, do. AFANASEJEFF 1909; Jelovka BEZAIS 1909.

»Kamtchatka»: KUSMISCHEFF.

In Kamtchatka this plant apparently chiefly inhabits the central valley.

It is with great hesitation that I follow ANDRES, and take our plant to be a variety of *P. retundifolia*. To me it seems more rational to regard *P. retundifolia* (in the wide sense) as a white-flowered, chiefly Eurasiatic plant, with the head-form distributed throughout Europe and Asia but represented in southern Asia by several varieties or subspecies with smaller area (subsp. *indica*, subsp. *tibetica*, subsp. *chinensis*, subsp. *laburnea*), and in the whole Arctic by a comparatively different form (subsp. *grandiflora*), which in Eastern America has developed into var. *americana*. (Comp. ANDRES in Österr. Bot. Zeitschr. LXIV, 1914 pp. 45—50 and 232—243 and FERNALD in Rhodora 22, 1920 p. 121). Throughout N. America, especially to the west, this group is represented by purple-flowered forms, and very similar purple-flowered forms occur also in Asia, westwards to Tomsk prov. In Asia, therefore, usually both white-flowered and purple-flowered forms occur, and it seems more natural to connect the purple-flowered with the purple-flowered American types, which they resemble also in regard to habitus, and the white-flowered with the white-flowered European types. As both groups differ in comparatively few characteristics and must thus be considered to be closely related, one must also consider the possibility that in areas where both are present hybrids between them exist (compare the conditions of *Saxifraga* and *Phyllodoce* in Kamtchatka) thus enhancing the difficulty of drawing a line of demarcation between the two. However, no white-flowered plant of this group is known from Kamtchatka, and the Kamtchatka specimens thus offer a good material for enabling us to judge the identity or relationship of the red-flowered plants of the *P. retundifolia* group in America and Asia. From typical *P. retundifolia* they differ in the same way as most other Asiatic specimens of »var. *incarnata*», viz. in larger thicker broader often heartshaped or reniform leaves, coarser stem, more prolonged inflorescence with fewer and more scattered flowers, and by purple petals, sepals and bracts. (Comp. KOMAROV in Acta Horti Petrop. XXV, 1905 p. 195.)

The Siberian plant differs from *P. asarifolia*, acc. to ANDRES loc. cit. p. 47, in not having reniform leaves — if they are occasionally reniform, then the sepals are lanceolate and the flowers not red (*sic!* — and lanceolate sepals). As far as I can see, those two characteristics are practically the only ones quoted as differences between the types and they cannot in any way be said to be sharp, although American specimens more frequently have reniform leaves and sepals with broader base (or often broadest somewhat above the base). Such extremely lanceolate sepals as the one reproduced by ANDRES in Berichte Deutsch. Bot. Ges. 30 (1912) p. 563 fig. 5 (where he discusses the differences between *P. asarifolia*, *P. uliginosa* and *P. retundifolia*) are rarely found in »*P. retundifolia* v. *incarnata*», while those reproduced in loc. cit. fig. 3 are

often met with in the Kamtchatka material and also in other parts of E. Asia (compare Herd. Fl. Kor. No 1333 which has broader sepals, and No. 1334 a which has narrower). I can therefore find no very pronounced difference between *P. asarifolia* and *P. rotundifolia* var. *incarnata*.

Type of distribution: Circumpolar.

Geographical area. *P. rotundifolia* sens. lat. White-flowered forms: Comp. Arctica in Ostern Bot. Zeitschr. LXIV, 1914. Europe from northernmost Scandinavia, Kola Penins. and Nova Zemnia southwards to Spain, central Italy and Caucasus. Asia from lower Yenisei and Lena rivers and from Chutch Penins. southwards to northern India, subsp. *rotundifolia* and northern China to the south subsp. *dimorpha*, subsp. *tibetana*, subsp. *chinensis*. In the arctic part of this area in Greenland and in arctic America subsp. *grandiflora* and in E. America var. *quercina* (comp. Fernald in Rhodora 22. 1920 p. 121). Purple-flowered forms: var. *incarnata* in Asia from about Ob. river east wards to Chutch Penins. and southwards to northern China and Japan. In America closely related purple-flowered types *P. asarifolia*, *P. uliginosa*, from the Pacific to the Atlantic; in W. America also *P. bracteata*.

68b. Pyrola secunda L., Sp. pl. ed. I (1753) p. 396.

Herder, M. Kadd. Monogr. No. 61 in Kjellm., Reisen IV: 1 p. 85 et Acta Hort. Petrop. I. 2 (1872) p. 327 s. synon. Kjellm. Veg. Kamtch. p. 235 et Fl. Penins. Kamtsch. II p. 556. — *Pyrola secunda* subsp. *Asarum* in Diagnoses Nov. Monandr. XXII 1919 p. 4.

South Kamtchatka: Lake Kronotz Komarov 1908. Mt. Zerzalo Natchika Komarov 1908; Natchika July 7th 1920 Hx No. 251 a. »Uski myata» between Natchika and Korjaka Komarov 1908.

East Kamtchatka: Petropavlovsk July 21st 1920 Hx No. 537.

Central Kamtchatka: Ganala Komarov 1909 acc. to Kom. loc. cit.; Milkova Komarov 1908. Klyuchi Komarov 1908 Hx Berg. Machura Ostrov 1908 do Komarov 1908, Shishkina Komarov 1908 do July 22nd 1921 Hx No. 5012 Malaise. Sukoki Komarov 1908, Tolbatchik Komarov 1908 acc. to Kom. loc. cit. the Kamtchatka mts. Petrovskoye 1908, Klyuchi Bazaar 1908 do. in Lariciforest July 27th 1926 Malaise No. 419.

»Kamtchatka»: Kuznetzoff acc. to Herder loc. cit., Kastalsky, Petrov.

Kamtchatka specimens of this plant are comparatively typical. They can hardly belong to the arctic form of the species, which passes under several different names (*P. secunda* var. *obtusata* Turcz. *P. secunda* var. *borealis* Lange, *Pyrenaica obtusata* Fries, and *P.* var. *arctostaphylos* Turcz.) but which was first described by Chamisso (Linnaea I. 1826 p. 514 as »*Pyrenaea pumila* β *arctica*»).

Our plant flowers in July.

Type of distribution: Circumpolar.

Geographical area: The entire species: Europe: from Iceland, northernmost Scandinavia, Kola penins. and Kanin, southwards chiefly in the mts. to northern Spain, Sicily, Thessaly, Crimea and Caucasus (not in Belgium or the Russian steppe-zone). Asia: from the mouths of Yenisei and Lena rivers southwards to Asia Minor, eastern Turkestan, northern Mongolia, Corea and Honshu. America: from Alaska to Labrador and Newfoundland, southwards to California, New Mexico, Michigan and New Jersey, (the often cited plant from mt. Orizaba in Mexico belongs, acc. to RYDBERG, to a separate species). W. Greenland (about Disco). Var. *obtusata* occurs in the northern part of this area from the northern Urals eastwards to Labrador and Greenland southwards to lower Tunguska, and Zeja river.

604. ***Pyrola uniflora*** L., Sp. pl. ed. I (1753) p. 397.

Moneses grandiflora KOM., Voy. Kamtch. p. 255. — *Moneses uniflora* KOM., Fl. Penins. Kamtsch. II p. 355.

East Kamtchatka: Between Petropavlovsk and Avatcha volcano in *Pinus pumila* thickets acc. to NOVOGRABLENOF in letter.

Central Kamtchatka: Mashura GRINOF 1909, do. KOMAROV 1909 (Hb. Berol.); Shtchapina KOMAROV 1909, do. July 22nd 1921 HN No. 3471 (MALAISE); Jelovka BEZAIS 1909.

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland, northernmost Scandinavia, Kola penins. and northern Perm., southwards to Ireland, Scotland, N.E. Spain, Corsica, Sicily, Bulgaria, Moskovsk, Kazan and Orenburg, a few scattered localities further to the south in Russia and in the Caucasus, not known from Belgium and N. France. Asia: at Obi and Yenisei from about 65° N. lat., from Vilju and Jakutsk districts, southwards to Akmolinsk and Semiretchensk prov., northern Mongolia, Sze-ch'uan (Ta-tsien-lu!), Shansi, Corea and Saghalin, also in S.W. Yeso and on Kamtchatka. America: from Alaska to Labrador and Newfoundland, southwards to New Mexico, Minnesota, Michigan and Pennsylvania. (Reports sometimes seen in literature from Greenland, Chukch Penins. and other arctic countries are probably due to confusion with *Pyrola grandiflora* RAD., which name is wrongly taken to be a synonym for *Moneses grandiflora* SALISB.)

Ericaceae DC.

605. ***Ledum palustre*** L., Sp. pl. ed. I (1753) p. 391.

subsp. ***decumbens*** (Ait.) nov. comb.

»*Ledum* fl. lapp. 160» GMEL., Fl. Sib. IV p. 127 quoad pl. Kamtsch. — *Ledum palustre* PENNANT, Arct. Zool. (1784) p. CXV; GEORGI, Beschreib. III: 4 p. 953 quoad pl. Kamtsch.; MERTENS, Bemerk. Fl. Koragins p. 62; LEDEB., Fl. Ross. II p. 923 (β *vulgare*, quoad pl. Kamtsch.); HERDER, Pl. Radd. Monopet. No. 52 in Acta Horti Petrop. I: 2 (1872) p. 352 et RADDE, Reisen IV: 1 p. 70 (β *angustifolium*) quoad pl. Kamtsch.; MAXIM., Rhododendr. As. Orient. p. 49; FEDTSCH.,

Fl. Îl. Comm. p. 89; Kom., Voy. Kamtch. p. 451 et Fl. Penins. Kamtsch. II p. 356; E. Busch in Fl. Sib. et Orient. extr. 2 (1915) p. 3 (var. *dilatatum*, var. *vulgare*, var. *angustum*, var. *decumbens*) quoad pl. Kamtsch. (excl. pl. Grote); Kuznets. in Fl. As. Ross. 9 (1916) p. 7. quoad pl. Kamtsch. — [*Ledum palustre* var. *decumbens* Ait., Hort. Kew. II (1789) p. 65.]

South Kamtchatka: N. of Ozernaja village noted in heath by Hn; between Javina and Kochegochek noted in A. 94; lower Golygina R. noted in heath by Hn; between Kochegochek and Golygina noted in A. 102; S. of Golygina village noted in heath by Hn; Golygina village noted by Hn; between the mouths of Golygina and Opala villages noted by Hn; near Shadutka volcano noted in A. 82; the Savan mts. noted in A. 78 c; Lake Kambolnoje noted in A. 218; the mouth of Artemjeva R. noted in A. 220; Akhomten Bay 800 m. Sept. 18th 1920 Hn No. 1399 (A. 33); Gorelaja volcano noted in A. 172; between Opala volcano and Lake Tolmachovaja noted in A. 158; Opala volcano 620 m. July 21st 1921 Hn No. 2354 (A. 70 a); Lake Tolmachovaja 800 m. July 11th 1922 Hn No. 3890 b; near the mouth of Bolshaja R. July 4th 1921 Hn No. 1943 (A. 45, A. 46, A. 49, A. 51); lower Bolshaja R. noted in A. 108, A. 109 a, A. 110; lower Karymchina R. in *Rubus chamaemorus* ass. noted by Hn; the mouth of Ipelka R. noted in A. 58, A. 59 a; S. of Bolsheredsk in *Rubus chamaemorus* ass. noted by Hn; Bolsheredsk Bezais 1909; Apatcha noted by Hn; Mt. »Zaikin Mys» Paratunka Komarov 1908; Paratunka Komarov 1908; between Paratunka and Mikisha Komarov 1908; Mt. Taburett (Lake Natchika) Rubinski 1909; Natchika Komarov 1908; Poperochnaja R. acc. to Kom. loc. cit. p. 105; Mt. Palovinaja 900 m. (Savoiko) July 8th 1920 Hn No. 304, do. June 29th 1928 W. Eyerdam; the Korjaka valley Rubinski 1908.

East Kamtchatka: Between Petropavlovsk and Savoiko July 5th 1920 Hn No. 216; between Petropavlovsk and Avatcha volcano 350 m. noted in A. 13; the Kronoki Pass acc. to Kom. loc. cit.; Lake Kronoki Sept. 4th 1921 Hn No. 3569 (Malaise), do. 900 m. Sept. 12th 1921 Hn No. 3600 (Malaise); Ustj Kamtchatsk June 1925 Malaise No. 500.

Commander Islands: Bering Island Steller, Dybovsky, Stejneger all acc. to Fedtsch. loc. cit. Copper Island Stejneger, Morozevicz both acc. to Fedtsch. loc. cit.

Central Kamtchatka: Between Malka and Ganala acc. to Kom. loc. cit. p. 194; Ganala Komarov 1909; between Ganala and Pushtchina Grinop 1909; Kamtchatka Vershina acc. to Kom. loc. cit.; between Sharomsk and Vershne Kamtchatsk Protopopof 1908; between Kirganik and Mashura acc. to Kom. loc. cit.; Shtchapina July 23rd 1921 Hn No. 3475 (Malaise); Mt. Kunchekla Grinop 1909; Svetloj Klutch R. May 22nd 1925 Malaise No. 499; between Shtchapina and Tolbatchik Komarov 1909 (Hb. Berol.); Anauna R. Aug. 19th 1926 Malaise No. 406; Kosyrevsk Protopopof 1909.

West and North Kamtchatka: Chairusovaja Novikof 1909; between Sedanka and Jelovka Bezais 1909; Tigil Levitzky 1848, do. Gudzenko 1910; Karaginsk Island Postels, do. Mertens, do. Loginovski 1910.

»Kamtchatka»: Steller and Kraschenninikof acc. to Gmel. loc. cit., Lubarsky, Kusmischeff, Mertens, Kittlitz, Peters, Rieder.

Noted in the following associations:

In *Carex—Rubus chamaemorus—Vaccinium—Empetrum* ass.:
Single (A. 51); Sparse (A. 45, A. 49, A. 59 a, A. 220); Scattered (A. 46, A. 109 a); Abundant (A. 58).

In *Carex—Myrica* ass.:
Single (A. 110).

In *Vaccinium—Empetrum*—Moss ass.:
Sparse (A. 172, A. 218); Scattered (A. 108).

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 70 a); Sparse (A. 82, A. 94, A. 102, A. 158); Scattered (A. 78 c).

In *Pinus pumila—Rhododendron*—Moss ass.
Abundant (A. 33).

In the heaths and *Rubus chamaemorus*-bogs of South Kamtchatka this plant is common. It flowers at the end of June and the beginning of July.

All the specimens that I have seen in nature, or which are collected with certainty within our area (compare under »*L. palustre* var. *dilatatum*») belong to subsp. *decumbens*. The differences between that plant and typical *L. palustre* are thoroughly discussed by Porsild in Medd. om Grönland LVIII (1920) pp. 118—132. To the distinguishing characteristics given there may be added the fact that the leaves are considerably thicker in subsp. *decumbens* than in the head form. One of the most important characteristics of our plant pointed out by Porsild loc. cit. is certainly the form of the peduncles of the ripe capsules, which are abruptly bent close under the capsule and not evenly curved as in the European plant. *L. palustre* subsp. *decumbens* has a large confluent geographical area of its own from W. Greenland over America to N.E. Asia, and might as well be regarded as a distinct species. I take it here to be a subspecies of *L. palustre* only because there seem to exist forms that are difficult to determine as belonging to the one type or the other in Northern Asia, where the areas of the two plants meet. Although the genus *Ledum* was recently dealt with in two large Russian works on the flora of Asia, unfortunately no critical revision of those forms has at yet been undertaken. Such a revision may possibly lead to the conclusion that two distinct species are present in northern Asia.

The geographical areas of the different *Ledum*-types are very interesting. A summary of them is given below.

Type of distribution: The head-species: Eurasiatic. subsp. *decumbens:* American transgressing into Eastern Asia.

Geographical area: The head species: Europe: from eastern Scandinavia, Mecklenburg and Hannover eastwards, in the north from the northern coast of Kola Penins. and northernmost Russia, southwards to Bohemia, lower Austria, Kazan and Ufa (with isolated localities somewhat outside this area). A map

of the European distribution is given by GRANLUND in Geogr. Annal. 1925 p. 96 (the whole of Kola Penins. should be included in the area of the species). Asia: throughout Siberia, southwards to southern Tomsk prov., Irkutsk prov. and Ussuri, the northern limit unknown. Subsp. *decumbens:* Asia: at least from the mouth of Yenisei R. eastwards to Chukch Penins. and southern Kamtchatka. America: arctic N. America from Alaska to Baffin Land and Newfoundland, also W. Greenland. In E. Greenland, in Iceland and in westernmost Europe no *Ledum*-form is present. In W. Greenland and throughout America to Alaska the broad-leaved *L. groenlandicum* OED. and in E. Asia (from Ochotsk and the Kuriles over Saghalin and Ussuri to S. Japan) *L. hypoleucum* KOM., a broad-leaved type very closely related to *L. groenlandicum* (compare under *L. palustre* var. *dilatatum*). In W. America (from British Columbia to California) the broad-leaved and comparatively widely different *L. glandulosum* NUTT.

»**Ledum palustre** var. **dilatatum** WAHL.»

MAXIM., Rhodendr. As. orient. p. 49; E. BUSCH in Fl. Sib. Orient. Extrem. II (1915) p. 12 quoad pl. Kamtsch. leg. GROTE; KUDO, Fl. Paramush. p. 141.

The *Ledum* form described under this name by WAHLENBERG seems to be only an occasionally occurring broad-leaved form of *L. palustre* represented by only some few specimens from northern Scandinavia in Hb. Holm. The name has later been used for several broad-leaved *Ledum* forms both in America and Asia, which certainly do not correspond to WAHLENBERG's plant. Thus, the broad-leaved type occurring in Eastern Asia and occupying a confluent area from Ochotsk and the Kuriles over Ussuri and Saghalin to southern Japan can hardly be combined with those broad-leaved plants in Lappland, but represent a separate type closely related to or possibly identical with *L. groenlandicum.* It went, however, under the name of *L. palustre* var. *dilatatum* until it was recently described by KOMAROV as *L. hypoleucum.* To this type belongs a specimen in Hb. Hort. Petrop. labelled »Kamtschatka 53° 36′ GROTE Herb. FISCHER». It was most probably not collected on the Kamtchatka Peninsula, as GROTE is otherwise not known to have collected plants there, but possibly in »Kamtchatka Province» on the W. side of the Ochotsk Sea (compare HULTÉN, Fl. Kamtch. I p. 6). A second report of this plant from our area — that of KUDO from Paramushir island »Sine loco indicato (N. HASHIMOTO 1908)» — also seems to need confirmation, as HASHIMOTO is reported as being a collector of several other plants that are common more to the south but otherwise not known from Paramushir. As, however, this broad-leaved *Ledum* goes so far to the north as Ochotsk it might possibly occur also on the northern Kuriles or on the Kamtchatka Peninsula.

606. ***Rhododendron chrysanthum*** PALLAS, Reise durch versch. Prov. Russ. Reich. III (1776) p. 729 Tab. N fig. 1, 2.

PALLAS, Fl. Ross. I p. 44 tab. XXX; GEORGI, Beschreib. III: 4 p. 955; MERTENS, Bemerk. Fl. Koragins p. 63; ERMAN, Verzeichn. p. 59; LEDEB., Fl. Ross. II p. 920; KITTLITZ, Denkw. II p. 336; MAXIM., Rhododendr. As. Orient. p. 20; HER-

DER, Pl. Radd. Monopet. No. 46 in Acta Horti Petrop. I: 2 (1872) p. 345 et RADDE, Reisen IV: 1 p. 63; MIYABE, Fl. Kuril. p. 247; DITMAR, Reisen I pp. 109, 254, 257, 264, 270, 433, 447, Reisen II p. 86; YABE & YENDO, Fl. Shimushu p. (190); FEDTSCH., Fl. Îl. Comm. p. 88: KOM., Voy. Kamtch. pp. 59, 63, 66, 454 et Fl. Penins. Kamtsch. II p. 359; E. BUSCH in Fl. Sib. et Orient. Extr. 2 (1915) p. 18 et tab. 63; KUZNETS. in Fl. As. Ross. 9 (1916) p. 23; KUDO, Fl. Paramush. p. 141. — »*Andromeda foliis ovatis . . .*» GMEL., Fl. Sib. IV p. 121. — »*Andromeda* GM. Sib. IV 121 No. 9» PENNANT, Arct. Zool. (1784) p. CXV.

Northern Kuriles: Paramushir M. AIZAWA 1900; KUDO 1920; Shumshu acc. to MIYABE loc. cit. and YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka, E. coast June 17th 1920 HN No. 30, do. W. coast June 24th 1920 HN No. 137; »In Kamtchatka usque ad Lopatka frequens non in Insulis Hb. PALLAS, Hb. FISCH.»; Kambolnaja BEZAIS 1908; 15 verst S. of Ozernaja RUBINSKI 1908; Kurile Lake noted by HN; Ozernaja BEZAIS 1909; N. of Ozernaja village in heath noted by HN; Illina volcano 500 m. noted by HN; S. of Golygina village in heath noted by HN; between the mouths of Golygina and Opala rivers in heath noted by HN; W. Shadutka R. noted by HN; Shadutka volcano 1160 m. noted by HN; the divide between Savan and Shadutka rivers noted in A. 81; Savan Mts. 700 m. noted by HN; Topik 470 m. noted by HN; Assatcha Mts. 1125 m. noted by HN; N. slope of Assatcha Mts. covering large areas between 650 and 700 m. noted by HN; Akhomten Bay 800 m. Sept. 18th 1920 HN No. 1397 (A. 33); Mutnovskaja volcano up to 1460 m. noted by HN; Gorelaja volcano noted in A. 162, A. 163, A. 167, A. 169, A. 173; Opala volcano 620 m. July 21st 1921 HN No. 2243 (A. 72, A. 74); Lake Tolmachovaja noted by HN; upper Tolmachovaja R. 840 m. noted by HN; middle Karymchina R. 330 m. noted by HN; Mt. Zaikin Mys. Paratunka KOMAROV 1908 (Hb. Berol.); Paratunka-Bystraja R. SAVITCH 1908; Tarja Bay KOMAROV 1908; Mt. Taburett (Natchika) RUBINSKI 1908; Shalsan VOSSNESENSKY 1848; Mt. Shapotchka, Natchika KOMAROV 1908; Mt. Zerkalo, Natchika RUBINSKI 1909, do. noted in A. 117; Mt. Palovinaja 900 m., Savoiko July 8th 1920 HN No. 308, do. W. EYERDAM 1928, do. July 22nd 1928 MALAISE; between Savoiko and Petropavlovsk July 5th 1920 HN No. 223; between Savoiko and Korjaka KITTLITZ, do. GRINOP 1909, do. RUBINSKI 1909; do. Mt. Talovaja RUBINSKI 1908.

East Kamtchatka: Cape Shipunski acc. to DITMAR loc. cit. pp. 254, 257, 264; near Haliger acc. to DITMAR loc. cit. p. 270; lakes at the sources of Avatcha R. acc. to DITMAR loc. cit. p. 724; Kichpinitch volcano acc. to KOMAROV loc. cit.; Taunchits volcano acc. to DITMAR loc. cit. p. 747; Mt. Krascheninnikof acc. to KOMAROV loc. cit.; Lake Kronoki 900 m. Sept. 12th 1921 HN No. 3575 (MALAISE); Klutchevskaja volcano 3600 feet BEZAIS 1908; the foot of Klutchevskaja volcano AFANASEJEV 1909; Lake Nerpitche, Tarchovski mts. acc. to KOM. loc. cit.

Commander Islands: Bering Island: STELLER, DYBOVSKY, STEJNEGER, DOBROTVORSKY, GREBNITZKY all acc. to FEDTSCH. loc. cit., KJELLMAN, PROTO-

POPOF; Copper Island: DYBOVSKY, TILMAN, STEJNEGER, MOROZEWICZ all acc. to FEDTSCH. loc. cit., KLJOSS 1921 (Hb. Holm.).

Central Kamtchatka: Mt. Zerkalo, Malka PROTOPOPOF 1908; between Malka and Ganala STEWART; the Ganala »tundra» PROTOPOPOF 1908; Kamtchatka vershina acc. to DITMAR and KOMAROV loc. cit.; Kashkan R., Pushtchina acc. to KOMAROV loc. cit.; Bolshaja Baidarka R. PROTOPOPOF 1909; Klutchi KOZLOVSKI 1909, do. 500 m. June 12th 1921 HN No. 3342 (BERGMAN).

West and North Kamtchatka: Itchinsk BJELOUSSOF; between Jelovka and Sedanka acc. to ERMAN loc. cit., do. Aug. 20th 1927 VAVILIN; Tigil LEVITZKY; Ozernaja (E. coast) SKOBUNOV 1920 acc. to KOM. loc. cit.; Pallan LONGINOF 1927; Karaginsk Island MERTENS, do. LOGINOVSKI 1910, do. MERK and POSTELS acc. to HERDER loc. cit.

»Kamtchatka»: STELLER acc. to GMEL. loc. cit., LANGSDORFF and TILESIUS acc. to HERDER loc. cit., RASTARGUJEFF, LUBARSKY, STEWART, KUSMISCHEFF, PETERS, RIEDER (Hb. Holm.).

Noted in the following associations:

In *Vaccinium—Empetrum—Rhododendron chrysanthum* ass.:
Profuse (A. 117, A. 162, A. 167, A. 169, A. 173).

In *Pinus pumila—Rhododendron*—Moss ass.:
Single (A. 33. A. 74, A. 81); Abundant (A. 163).

In *Artemisia arctica—Rhododendron kamtschaticum—Salix »arctica»* ass.:
Sparse (A. 72).

In South Kamtchatka *Rh. chrysanthum* is common all over the alpine region. It is characteristic of a special kind of heath occurring abundantly, especially on slopes exposed to the south in the middle part of the alpine region (about 700—900 m.). The *Pinus pumila* thickets in that region are practically invariably surrounded by a compact border of our plant, while it occurs more scattered in the middle of those thickets. Our plant flowers very early —already in the beginning of June.

In Kamtchatka *Rh. chrysanthum* usually attains a height of about 2—3 dm. but in the Sajan mts. at an altitude of 1000—1100 m. it forms, acc. to PRINTZ, almost inpenetrable thickets about one metre high.

Type of distribution: Eastern Asiatic.

Geographical area: From Altai eastwards, northwards to Vilju distr., lower Kolyma R. and Anadyr, southwards to Sajan Mts., mts. of Amur Prov., Corea and Honshu. Also on Commander Islands. The plant is often reported from America, and specimens labelled Sitcha are preserved in Hb. Hort. Petrop., but such reports are probably incorrect. A map of the distribution is given by E. BUSCH loc. cit. p. 18. To this should be added localities in Corea, Yezo and Honshu. In the Caucasus the related *Rh. caucasium* PALL.

Rhododendron dauricum L.

PALL., Fl. Ross. I: 1 p. 47; GEORGI, Beschreib. III: 4 p. 954; MAXIM., Rhododendr. As. orient. p. 44 (var. α *dauricum*); KUZNETS in Fl. As. Ross. 9 (1916) p. 23.

PALLAS reports STELLER as having collected this plant in Kamtchatka. Later authors seem to have cited that report. In Hb. Acad. Petrop. there is preserved a specimen labelled »Kamtschatka $^{14}/_{6}$ 49 No. 150 STUBENDORFF» and »Petropavlovsk MERTENS». As both those labels belong to doubtful types I think that they hardly confirm the occurrence of the plant in Kamtchatka. The species is not known with any certainty to occur within our area.

607. ***Rhododendron kamtschaticum*** PALLAS, Fl. Ross. I: 1 (1784) p. 48 tab. 33.

GEORGI, Beschreib. III: 4 p. 956; MERTENS, Bemerk. Fl. Koragins p. 64; CHAMISSO, Reise u. d. Welt p. 347; CHAMISSO in Linnaea I (1826) p. 513; HOOK. & ARNOTT in Beechy's Voy. p. 116; LEDEB., Fl. Ross. II p. 922; HERDER, Pl. Radd. Monopet. No. 49 in Acta Horti Petrop. I: 2 (1872) p. 349 et RADDE, Reisen IV: 1 p. 67; MAXIM., Rhododendr. As. Orient. p. 47; DITMAR, Reise I pp. 109, 223, Reise II p. 86; YABE & YENDO, Fl. Shimushu p. (190); FEDTSCH., Fl. Îl. Comm. p. 88; KOM., Voy. Kamtch. pp. 32 (»*kamczaticum*»), 415, 454 (»*kamtschaticum*») et Fl. Penins. Kamtsch. II p. 360; E. BUSCH in Fl. Sib. Orient. extr. 2 (1915) p. 35 (also var. *pumilum*); KUZNETS. in Fl. As. Ross. 9 (1916) p. 23; KUDO, Fl. Paramush. p. 142. — »*Chamaerhododendros Berberis folio, flore ample roseo . . .*» GMEL, Fl. Sib. IV p. 126. — »*Chamaerhododendros* GM. Sib. IV 126 No. 13» PENNANT, Arct. Zool. (1784) p. CXV.

Subsp. ***typicum*** nov. subsp.

Northern Kuriles: Paramushir C. TARO 1892, MATSUBARA 1915, KUDO 1920 all acc. to KUDO loc. cit.; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Lopatka about »Tshumta» VOSSNESENSKY acc. to BUSCH loc. cit.; N. of Ozernaja village in heath noted by HN; near Sholtovskaja volcano 500 m. Aug. 23rd 1922 HN No. 4378 (A. 205); Mt. »Dogshinag» Golygina R. RUBINSKI 1909; Shadutka volcano 1125 m. noted by HN; Topik 470 m. noted by HN; Assatcha mts. 650 m. noted by HN; Akhomten Bay Aug. 30th 1920 HN No. 1178 (MALAISE), do. 250 m. Sept. 9th 1920 HN. No. 1207, do. 50 m. Sept. 22nd 1920 HN No. 1462, do. noted in A. 26, A. 33, A. 36 a, A. 36 b; Gorelaja volcano 900 m. noted in A. 171; Opala volcano 1040 m. July 21st 1921 HN No. 2337, do. 1300 m. noted by HN, do. noted in A. 71, A. 72, A. 73, A. 74; Glinini mts. RUBINSKI 1909; Mt. Babi kamen, Paratunka R. KOMAROV 1908; mts. at Lake Blishne KOMAROV 1908; Toporkoff (= Starichkoff) island, Sarannaja Bay PERFILJEF 1911; Seljdovaja pad R. SAVITCH 1908; Shalsan VOSSNESENSKY 1848, do. KOMAROV 1908; mt. Tshapochka, Natchika KOMAROV 1908; mt. Zerkalo, Natchika noted in A. 117; Natchika STEWART, Poperochnaja R. KOMAROV 1908, do. SAVITCH 1908; mt. Palovinaja, Savoiko 800 m. July 8th 1920 HN No. 310, do. Aug. 1st and July 22nd 1928 W. EYERDAM.

East Kamtchatka: Petropavlovsk STEWART, do. KASTALSKY, do. MERTENS, do. VOSSNESENSKY 1848, do. GUDZENKO 1910, do. July 4th 1920 HN No. 202 b, do. July 8th 1920 HN No. 310, do. W. EYERDAM 1928; Kalashtyrka valley KOMAROV 1909; Avatcha volcano PERFILJEF 1909, do. 900 m. July 30th

1920 Hn No. 583; near the mouth of Shupanova R. acc. to Kom. loc. cit.; Semjatchik July 1923 Malaise.

Commander Islands: Bering Island Steller acc. to Pallas loc. cit.; Kjellman, Dybovsky, Dobrotvorsky, Grebnitzky, Gudzenko 1910 and acc. to Fedtsch. loc. cit. Stejneger; Copper Island Dybovsky 1879 and acc. to Fedtsch loc. cit. Stejneger, Tilman and Morozevicz.

»Kamtchatka»: Steller acc. to Pallas loc. cit.; »Pallas Herb. Fischer»? Steller's specimen later added in Russian »collected by Merk»; Chamisso, Eschscholtz, Choris, Lubarsky, Stewart, Kastalsky, Kusmischeff, Mertens, Postels, Peters, Rieder.

Noted in the following associations:

In *Artemisia arctica—Solidago—Salix* »*arctica*» ass.:
Single (A. 26, A. 73); Sparse (A. 71, A. 205).

In *Artemisia arctica—Rhododendron kamtschaticum—Salix* »*arctica*» ass.:
Profuse (A. 36 a, A. 36 b, A. 72, A. 171).

In *Pinus pumila—Rhododendron*—Moss ass.:
Single (A. 33, A. 74).

In *Vaccinium—Empetrum—Rhododendron chrysanthum* ass.:
Sparse (A. 117).

Subsp. ***glandulosum*** (Standley) nov. comb.

East Kamtchatka: Klutchevskaja volcano Bezais 1908, do. Afanasejef 1909, do. Aug. 6th 1927 Malaise; Shivelutch 3500 feet Kozlovsky.

West and North Kamtchatka: Itcha R. Bjeloussof 1914; between Sedanka and Jelovka Bezais 1909; Pallan Ditmar acc. to Kom. loc. cit.; Ljesnaja Bay Bjeloussof 1914; Cape Ugolnaja Bjeloussof 1914; Ozernaja R. Skobunof 1920, Karaginsk Island Mertens, do. Loginovski 1910.

»Kamtchatka»: The specimens of Tilesius in Hb. Holm. and Hb. Petrop. were certainly not collected in Kamtchatka as they belong to a different form than does Kamtchatka specimens.

In South Kamtchatka *Rh. kamtschaticum* subsp. *typicum* is common in the meadows of the alpine region, and in the high-alpine part of that region. It is characteristic of the special kind of high-alpine meadows occurring up to the limit of vegetation, called by me the *Artemisia arctica—Rhododendron kamtschaticum—Salix* »*arctica*» ass. In the autumn, when the leaves of *Rh. kamtschaticum* are red-coloured, that association forms large red patches along the upper courses of the brooks in the mountains. Our plant also occurs, although more rarely, in the *Rh. chrysanthum* ass. or on the border of *Pinus pumila* thickets. It flowers in July and August.

Rh. kamtschaticum occurs within our area in two types. The plants from the southern and eastern part form, together with the specimens from the Kuriles, the Aleutian Islands and southern Alaska, one type characterized by larger growth, larger sterile basal shoots, with leaves long-ciliate but not

glandular in the margin, (the leaves of the flowering shoot are often glandular), larger corolla with broader lobes pubescent on the outside and strongly ciliate in the margin. The lobes of the corolla are slightly more than double as long as the tube. The illustration in CURTIS's Bot. Mag. CXXXIV (1908) tab. 8210 is this plant, which I consider to be the typical *Rh. kamtschaticum* of PALLAS and therefore give the name subsp. *typicum*. It occurs in a larger lowland form with longer, thinner and more long-petiolated leaves and usually narrower sepals, and in a low-grown alpine form with smaller, shorter, thicker and more rounded leaves and often broader sepals.

The plant from Klutchevskaja, northern Kamtchatka, Ajan, Ochotsk, Chukch Penins. and N. Alaska differs a good deal from that described above. It is characterized by low growth, small-leaved sterile basal-shoots, with leaves more short-ciliate and glandular in the margin, smaller corolla with narrower lobes glabrous or practically so on the outside and not ciliate in the margin. The lobes of the corolla are longer in comparison with the tube. This plant was described by STANDLEY in N. Amer. Fl. 29: 1 (1914) p. 45 as *Therorhodion glandulosum*.

If the extreme forms which both occur in Alaska one in the north and the other in the south were alone taken into consideration they whould certainly be taken as distinct species, but after a study of material of our plant from all parts of its area one must come to another conclusion. In the mts. of Sichota-Alin, in the Jablonai mts. in Udskoj distr. and on Saghalin there occurs a third form of our plant which can be said to unite the two subspecies described above, and which I propose to call subsp. *intercedens*. As far as regards habitus it resembles subsp. *typicum*, and has large corolla with broad lobes pubescent on the outside and ciliate in the margin, but the leaves of the sterile basal shoots are distinctly glandular as in subsp. *glandulosum*. One might possibly assume that this form, which occurs in places situated close to the centre of development of the genus *Rhododendron* in China, is an older form of the plant, which during its migration to America developed into different forms on the western and eastern branch separated by the Ochotsk Sea. Especially in subsp. *glandulosum* it is possible to state that specimens which originate from the eastern extremity of the area of the subspecies viz. in Chukch penins. and northern Alaska, are those that have reached the greatest differentiation while specimens from Ajan and northern Kamtchatka are somewhat closer to subsp. *typicum* or, which might be more correct, to subsp. *intercedens*. Thus specimens from northern Kamtchatka for instance often have very few glands in the margin of the basal leaves.

E. BUSCH loc. cit. describes a var. *pumilum* of *Rh. kamtschaticum*. On p. 38 she clearly states that her variety is a purely ecological form, and in her enumeration she refers to specimens belonging both to subsp. *typicum* and to subsp. *glandulosum*. In Kamtchatka both these subspecies seem to be separated from each other by a belt where no plant of this type occurs, as it was not collected by KOMAROV or MALAISE in the Kronoki district nor in the mts. at the source of Kamtchatka R. This indicates that subsp. *glandulosum* has

come to Kamtchatka from the north, while subsp. *typicum*, has spread over the country from the south.

Type of distribution: The entire species: Eastern Asiatic—Western American. Subsp. *typicum:* Northern Pacific.

Geographical area: Subsp. *typicum*: ? mts. of Honshu and Yezo, the Kuriles, southern and eastern Kamtchatka, Commander Islands, Aleutian Islands and southern Alaska to ? Sitcha.

Subsp. *glandulosum*: Jablonoj mts. (REDOWSKI), Ajan, Ochotsk, Gishiginsk, northern Kamtchatka, Chukch Penins. and N. Alaska (only known from Imuruk Basin about Port Clarence).

Subsp. *intercedens*: Primorsk Prov., Saghalin, Udskoj distr.

Rhododendron lapponicum (L.) WAHLENB.

var. **parvifolium** (ADAMS) HERD.

HERDER, Pl. Radd. Monopet. No. 45 in Acta Horti Petrop. I: 2 (1872) p. 343 et RADDE, Reisen IV: 1 p. 61; KUZNETS. in Fl. As. Ross. 9 (1916) p. 16. — *Rhododendron parvifolium* MAXIM., Rhododendr. As. Orient. p. 17.

The reports of this plant from Kamtchatka were founded partly on specimens collected by REDOWSKY and partly on specimens of MERTENS. As REDOWSKY never visited our area his plants were not collected there, and as also the specimens of MERTENS have often proved to be incorrectly labelled, the species has most probably to be excluded from the flora of Kamtchatka Peninsula.

Rhododendron Redowskianum MAXIM.

KUZNETS. in Fl. As. Ross. 9 (1916) p. 25.

The report of this species from Kamtchatka is certainly based on a specimen in Hb. Acad. Petrop. labelled »RED. Kamt.» As REDOWSKY did not visit our area the species should be excluded from the flora of Kamtchatka Peninsula.

Menziesia ferruginea SM.

MAXIM., Rhododendr. As. orient. p. 8; HERDER, Pl. Radd. Monopet. No. 41 in Acta Horti Petrop. I: 2 (1872) p. 338 et RADDE, Reisen IV: 1 p. 56; KUZNETS. in Fl. As. Ross. 9 (1916) p. 28; Cfr. E. BUSCH in Fl. Sib. Orient. extr. 2 (1915) p. 41.

The above-cited reports of *M. ferruginea* from Kamtchatka were founded on a specimen in Hb. Hort. Petrop. originally labelled »*ferruginea* MERK Hb. PALLAS». Later has been added »*Menziesia*» before *ferruginea* and after it »Sm., Herb. FISCH. Kamtchatka». The species should certainly be excluded from the flora of our area.

608. ***Loiseleuria procumbens*** (L.) DESV., Journ. bot. III (1813) p. 35.

LEDEB., Fl. Ross. II p. 918; HERDER, Pl. Radd. Monopet. No. 43 in Acta Horti Petrop. I: 2 (1872) p. 339 et RADDE, Reisen IV: 1 p. 57; MAXIM., Rhododendr. As. Orient. p. 7; YABE & YENDO, Fl. Shimushu p. (190); FEDTSCH., Fl. Îl. Comm. p. 87; KOM., Voy. Kamtch. pp. 63, 451, Fl. Penins. Kamtsch. I p. 333 et Fl. Penins. Kamtsch. II p. 362; E. BUSCH in Fl. Sib. Orient. extrem. II p. 42; KUZNETS. in Fl. As. Ross. 9 (1916) p. 31; KUDO, Fl. Paramush. p. 142. — *Azalea*

ramis diffuso-procumbentibus . . .» Gmel., Fl. Sib. IV p. 126. — [*Azalea procumbens* L., Sp. pl. ed. I (1753) p. 151]; Pallas, Fl. Ross. I: 2 p. 52; Georgi, Beschreib. III: 4 p. 768; Mertens, Bemerk. fl. Koragins p. 62; Erman, Verzeichn. p. 59.

Northern Kuriles: Paramushir M. Aizava 1900, T. Matsubara 1915 both acc. to Kudo loc. cit., Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka June 19th 1920 Hn No. 38; N.W. of Kurile Lake 1050 m. noted by Hn; Ozernaja R. Bezais 1909; N. of Illina volcano noted in A. 207; between the arms of Kochegochek rivers noted in A. 90 b; W. of Sholtovskaja volcano noted in A. 205; between Javina and Kochegochek rivers noted in A. 94; between the mouths of Kochegochek and Golygina rivers noted in A. 102; lower Golygina R. noted by Hn; Shadutka volcano 1260 m. noted by Hn; near Shadutka volcano noted in A. 82; Assatcha mts. 1125 m. noted by Hn; Akhomten Bay 250 m. Sept. 11th 1920 Hn No. 1303 (A. 36 a, A. 36 b); Mutnovskaja volcano 800 m. July 28th 1922 Hn No. 4034; Gorelaja volcano noted in A. 164, A. 166, A. 170, A. 171, A. 176; Opala volcano 1100 m. July 23rd 1921 Hn No. 2377 (A. 70 a, A. 72), do. 1300 m. noted by Hn; Lake Tolmachovaja noted in A. 159; between Opala and Lake Tolmachovaja noted in A. 158; upper and middle Tolmachovaja R. noted by Hn; »Staruchkina tundra» Bystraja R. 12 verst from Bolsheredsk Rubinski 1908; mt. Zaikin mys (Paratunka) Komarov 1908; the »Mikisha peat-lake» Komarov 1908; mt. Taburett, Lake Natchika, Rubinski 1909; mt. Tshapochka, Natchika Komarov 1908; mt. Zerkalo, Natchika Rubinski 1909; the top of Mt. Palovinaja, Savoiko July 1928 W. Eyerdam.

East Kamtchatka: Between Petropavlovsk and Avatcha volcano 350 m. June 24th 1921 Hn No. 1798; Avatcha volcano 900 m. July 30th 1920 Hn No. 579; Nalutcheva acc. to Kom. loc. cit.; Vahil R. acc. to Kom. loc. cit.; Semjatchik acc. to Kom. loc. cit.; Cape Kozlov June 30th 1923 Malaise; the Kronoki Pass and Lake Kronoki acc. to Kom. loc. cit.; Uzon Komarov 1909; Klutchevskaja volcano Kozlovski, do. Bezais 1909, do. N.E. slope Afanazejev 1909, do. Aug. 7th 1927 Malaise, do. at the foot Kurtashof; Ustj Kamtchatsk May 27th 1925 Malaise No. 501, do. June 1925 Malaise No. 502.

Commander Islands: Bering Island Grebnitsky 1894, Stejneger acc. to Fedtsch. loc. cit., Aug. 26th 1921 Sandberg (Hb. Holm.); Copper Island Grebnitzky, Stejneger and Morozevicz all. acc. to Fedtsch. loc. cit.

Central Kamtchatka: Malka Protopopof 1908; the foot of Korjatskaja volcano Komarov 1908; Korjatskaja volcano Aug. 18th 1928 W. Eyerdam; Ganala Stewart, do. Grinop 1909; sources of Kashkan R. Komarov 1909; between Sharomsk and Vershne Kamtchatsk Protopopof 1908; Svetloj kluch R. May 22nd 1925 Malaise.

West and North Kamtchatka: Between Sedanka and Jelovka acc. to Erman loc. cit., do. Bezais 1909; Tigil Levitzky 1848; Karaginsk Island Postels, do. Mertens, do. Loginovski 1910.

»Kamtchatka»: Merk, Kegel, Stewart, Kusmischeff, »Petrop. Mertens» (Hb. Acad. Petrop., with a second label »Ganalski mts.» written by Kittlitz), Peters, and acc. to Busch loc. cit. Stubendorff; collector unknown »Hb. Swartzii» (Hb. Holm.).

Noted in the following associations:

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 90 b); Scattered (A. 82, A. 207); Abundant (A. 70 a, A. 94, A. 102, A. 158, A. 159).

In *Vaccinium—Diapensia*—Lichen ass.:
Sparse (A. 170); Scattered (A. 164); Abundant (A. 166).

In *Artemisia arctica—Solidago—Salix »artica»* ass.:
Single (A. 205).

In *Artemisia arctica—Rhododendron kamtschaticum—Salix »arctica»* ass.:
Single (A. 36 a, A. 36 b, A. 72, A. 171).

In *Artemisia trifurcata—Salix »arctica»—Oxytropis* ass.:
Scattered (A. 176).

L. procumbens is common in the heaths of the alpine region in South Kamtchatka. In the high-alpine region it also occurs in the meadow-like associations ascending up to the limit of vegetation.

Type of distribution: American, transgressing into Europe and E. Asia.

Geographical area: Europe: Iceland, Scandinavia from the North Coast southwards in the mts. to central Sweden and southern Norway, Kola Penins., arctic Russia southwards in the Urals to central Perm prov., also in the Faroes, in Scotland, the Pyrenees, the Alps, the Carpathians and the Banat. Asia: One locality known from Irkutsk prov. (N. of Lake Baikal), from the mts. of northern Amur Prov., Saghalin and the mts. of Honshu to Ochotsk and Chukch Penins. America: from the north coast of Alaska to Baffin Land, and Labrador southwards to Alberta (54° N. lat.) and mts. of New Hampshire (44° N. lat.). W. Greenland (to 74° N. lat.). E. Greenland. A map of the Eurasiatic distribution is given by Busch loc. cit. To this should be added localities on Yezo, Honshu, and northern Chukch Penins. (Pitlekaj, Kjellman).

609. ***Phyllodoce aleutica*** (Spreng.) A. Heller in Muhlenbergia I (1900) p. 1 (not seen).

Fedtsch., Fl. Îl. Comm. p. 87; Kudo, Fl. Paramush. p. 143 (pro parte); Busch in Fl. Sib. Orient. extrem. II p. 48 (pro parte); Hultén in Sv. Bot. Tidskr. 22 (1928) 225; Kom., Fl. Penins. Kamtsch. II p. 365 (pro parte). — *Menziesia aleutica* Spreng. in L., Syst. Veg. II ed. XVI (1825) p. 202. — *Phyllodoce Pallasiana* D. Don in Edinb. New Phil. Journ. XVII (1834) p. 160; Ledeb., Fl. Ross. II p. 917; Maxim., Rhododendr. As. Orient. p. 6. — *Phyllodoce taxifolia* Salisb. β *aleutica* Herder, Pl. Radd. Monopet. No. 40 in Acta Horti Petrop. I: 2 (1872) p. 337 et Radde, Reisen IV: 1 p. 55 (pro parte); Kuznets. in Fl. As. Ross. 9 (1916) p. 34 (pro parte).

Northern Kuriles: Paramushir C. Taro 1892, T. Matsubara 1915, Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka Vossnesensky 1847; N.W. of Kurile Lake noted in A. 211; N. of Kurile Lake noted in A. 208; W. of Sholtovskaja volcano noted in A. 205; Mt. »Dogshinag», Golygina Rubinski 1909; Rukovitchkin Bay Rieder 1833; Akhomten Bay Aug. 30th 1920 Hn No. 1159 (Malaise), do. 250 m. Sept. 9th 1920 Hn No. 1208, do. Sept. 11th 1920 Hn No. 1298 (A. 26, A. 37 b, A. 38); Gorelaja volcano 600 m. noted by Hn; Opala volcano 1040 m. July 21st 1921 Hn No. 2309; Uzdets R. Komarov 1908 (mixed with hybrids); mt. Tshapotchka, Natchika Komarov 1908 (mixed with hybrids); Poperochnaja R. Komarov 1908 (mixed with hybrids); mt. Palovinaja 900 m. July 8th 1920 Hn No. 314, do. 600 m. July 8th 1920 Hn No. 348.

East Kamtchatka: Ozernaja R. July 23rd 1920 Skobunof.

Commander Islands: Copper Island Dybovsky 1879 (a sterile twig probably belonging to this species).

»Kamtchatka»: Levitzky.

Noted in the following associations:

In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Scattered (A 211).

In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 37 b, A. 208); Scattered (A. 38); Abundant (A. 26, A. 205).

Ph. aleutica is not rare in the alpine region of the southern part of South Kamtchatka, where it occurs in the meadows. Further to the north it is often replaced by the hybrid *Ph. aleutica*×*coerulea*. For differences from *Ph. coerulea* and discussion on the hybrid see under *Ph. aleutica*×*coerulea*. *Ph. aleutica* flowers in July and August.

Type of distribution: Northern Pacific.

Geographical area: Saghalin, Yezo, the Kuriles and S.W. Alaska. In Hb. Hort. Bot. Petrop. there is a sheet, acc. to the label from Sitcha, which contains our plant mixed with *Ph. glanduliflora*, but it seems to be doubtful whether our plant occurs so far east. E. Busch loc. cit. p. 49 gives a map of the distribution. To this should be added localities in the Kuriles, Yezo and Saghalin. In W. America from Alaska and Yukon southwards to Montana and Oregon the closely related *Ph. glanduliflora* (Hook.) Coville.

Phyllodoce aleutica × ***coerulea*** nov. hybr.

Andromeda taxifolia Pallas, Fl. Ross. I: 2 p. 54 pro parte; *Phyllodoce taxifolia* β *aleutica* Herder, Pl. Radd. Monopet. No. 40 in Acta Horti Petrop. I: 2 (1872) p. 337 et Radde, Reisen IV: 1 p. 55 pro parte; Kuznets. in Fl. As. Ross. 9 (1916) p. 34 pro parte. — *Phyllodoce coerulea* Fedtsch., Fl. Îl. Comm. p. 86 pro parte; Kom., Voy. Kamtch. p. 452 pro parte; E. Busch in Fl. Sib. Orient. extrem. II p. 46 pro parte; Kuznets. in Fl. As. Ross. 9 (1916) pro parte; Kom., Fl. Penins. Kamtsch. II p. 363 pro parte. — *Phyllodoce coerulea* var. *yezoensis* Koidz. in Bot. Mag. Tokyo 32 (1918) p. 58. — *Phyllodoce aleutica* E. Busch in Fl. Sib. Orient. extrem. II p. 48 pro parte; Kudo, Fl. Paramush. p. 143 pro parte; Kom., Fl. Penins. Kamtsch. II p. 365 pro parte.

Northern Kuriles: Paramushir (comp. KUDO loc. cit.).

South Kamtchatka: Cape Lopatka RIEDER 1833 (*Ph. taxifolia* det. KUZNETS., *Ph. aleutica* det. E. BUSCH); N. of Illina volcano noted by HN; mt. »Dogshinag» Golygina RUBINSKI 1909; Shadutka volcano 1260 m. noted by HN; Rukavitchkin Bay RIEDER 1833 (mixed with *Ph. aleutica*); Opala volcano 1100 m. July 21st 1921 HN No. 2290 a and b, do. 1040 m. July 21st 1921 HN No. 2303, do. 1100 m. July 23rd 1921 HN No. 2376 (A. 71, A. 73), do. noted up to 1300 m. by HN; Gorelaja volcano noted in A. 162, A. 167, A. 169, A. 171; the Kohelok Pass noted in A. 125; Mt. Babi Kamen, Paratunka KOMAROV 1909 (mixed with *Ph. coerulea*); upper Paratunka-Bystraja R. noted in A. 128; mt. Trubi KOMAROV 1908 (several forms); Tarja Bay, Seljdovaja R. KOMAROV 1908; Shalsan R. KOMAROV 1908; Uzdets R. KOMAROV 1908 (mixed with *Ph. aleutica*); mt. Tchapotchka KOMAROV 1908 (mixed with *Ph. aleutica*); mt. Zerkalo, Natchika noted in A. 117; Poperochnaja R. KOMAROV 1908 (mixed with *Ph. aleutica*); mt. Palovinaja, Savoiko 900 m. July 8th 1920 HN No. 315 a and c, do. W. EYERDAM 1928 (several forms), do. July 22th 1928 MALAISE.

East Kamtchatka: The Penishivo Pass July 28th 1928 W. EYERDAM; Klutchevskaja volcano 3600 feet BEZAIS 1908 (several forms).

Commander Islands: Bering Island DYBOVSKY 1894, GREBNITZKY.

Central Kamtchatka: Mt. Zerkalo, Malka PROTOPOPOF 1908; sources of Gremushej R. KOMAROV 1908 (mixed with *P. aleutica*); the Ganala tundra KOMAROV 1909; Ganala STEWART (also f. *subaleutica*); the sources of Kashkan R. KOMAROV 1909.

West and North Kamtchatka: Between Sedanka and Jelovka BEZAIS 1909 (mixed with *Ph. coerulea*).

»Kamtchatka»: KUSMISCHEFF, KEGEL, PETERS, RIEDER (Hb. Holm.).

Noted in the following associations:

In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Single (A. 125).

In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 71, A. 73); Abundant (A. 128).

In *Artemisia arctica—Rhododendron kamtschaticum—Salix »arctica»* ass.:
Sparse (A. 171).

In *Vaccinium—Empetrum—Rhododendron chrysanthum* ass.:
Sparse (A. 117, A. 162); Scattered (A. 169); Abundant (A. 167).

While pure *Ph. coerulea* is apparently a northern plant in Kamtchatka, and *Ph. aleutica* a southern plant, large parts of the country, especially its southern half, are full of hybrid forms of those two species. In nature this is easy to observe. A complete chain of innumerable forms connects the characteristic yellow-flowered *Ph. aleutica* with the quite different purplish-flowered *Ph. coerulea*. Forms with more or less deformed flowers of various colours and with irregularly placed leaves are met with everywhere, and there

can hardly be any doubt that they must be regarded as hybrids of the above-mentioned species. STELLER had already noticed this variation in the colour of the flowers and it is mentioned by PALLAS loc. cit. Various later authors have noticed it and tried to solve the question in various ways. For instance, HERDER united the two species and thus took the various types to be varieties of one species, KOIDZUMI loc. cit. described a hybrid form as a separate variety — var. *yezoensis* — of *Ph. coerulea*, and PRINTZ (Veg. Sib. Mong. front. p. 341) suggests that it is a distinct species, while others, E. BUSCH for instance, attempted the hopeless task of dividing the material between the two parent-species. E. BUSCH loc. cit. p. 47 fig. A illustrates a form of the hybrid under the name *Ph. coerulea*. The hybrid occurs in Yezo, Saghalin, the Kuriles, Commander Islands and in South Kamtchatka. In the last-mentioned place it is by far the most common *Phyllodoce*-type. It is questionable whether any of the specimens here referred to *Ph. coerulea* are entirely uninfluenced by *Ph. aleutica*, and this influence seems to be traceable in specimens far more to the north. Thus KJELLMAN reports *Ph. coerulea* f. *aleutica* from Konyam Bay and his description makes is evident that he had hybrid forms; and »*Ph. aleutica*» is also reported from Senjavin Bay. Certain characteristics, in the first place the long and very acute sepals of such specimens, indicate a slight influence from the other species. Those forms of the hybrid that are closely related to *Ph. coerulea*, as well as those that are but slightly influenced by that species, are difficult to distinguish from the pure forms, and the differences may therefore be discussed in some detail here. (Compare also RIKLI in Vierteljahrschr. Naturf. Ges., Zürich 66 (1921) p. 324.)

Ph. coerulea is a plant with less imbricate smaller leaves than *Ph. aleutica*. The groove on the upper surface of the leaves is deeper and the underside usually has a more narrow fissure. The flowers are long-pedunculated. The corolla is purplish, oblong-urceolate, somewhat narrower at the mouth, the sepals purplish, about one third as long as the corolla, acuminated or obtuse. The filaments are ciliated in their lower part and the anthers purplish, long, narrow and with comparatively long terminal tubes. The style is five-angled and the stigma distinctly capitate. *Ph. aleutica* has strongly imbricate larger leaves. The upper side of the leaves is more flat and the fissure on the underside broader. The flowers are gathered in bunches at the top of the stem, they are short-pedunculated (peduncles 1—3 times the length of the flowers) when the plant is in flower, but later more elongated. The corolla is yellow (in early stage greenish), practically spherical and much narrower at the mouth. The sepals are green, longer and more long-acuminated than in *Ph. coerulea*. The filaments are glabrous and the anthers yellow, short and broad with shorter terminal tubes. The style is shorter and thicker, provided with five deep grooves, and it ends without any capitate stigma, the grooves extending practically to the end of the style.

Of the above-enumerated differences those of the style and stigma and the ciliation of the filaments and forms of the anthers afford the best evidence

when it is a question of deciding whether a specimen belongs to any one of the parent species or whether it is a hybrid. The numerous intermediate hybrid forms are at once recognized. Sometimes characteristics occur in the hybrid that are not found in any of the parent species. Thus the styles are sometimes clavate or thicker at the middle, or the corolla more open and campanulate than in *Ph. coerulea* or *Ph. aleutica*.

It may be worth mentioning that a hybrid between *Ph. glanduliflora* and *Ph. empetriformis* is known from Western America.

610. ***Phyllodoce coerulea*** (L.) BAB., Manual Brit. Bot. ed. I (1843) p. 194.

FEDTSCH.. Fl. Îl. Comm. p. 86 pro parte; KOM., Voy. Kamtch. p. 452 et Fl. Penins. Kamtsch. II p. 363 pro parte, E. BUSCH in Fl. Sib. Orient. Extrem. II p. 46 pro parte; KUZNETS. in Fl. As. Ross. 9 (1916) p. 33 pro parte; RIKLI in Vierteljahrschr. Naturf. Ges. Zürich 66 (1921) p. 331. — [*Andromeda coerulea* L., Sp. pl. ed. 1 (1753) p. 393.] — »*Erica foliis aceroscis, glabris, imbricatis . . .*» GMEL., Fl. Sib. IV p. 131. — »*Er.* GM. Sib. IV 133 No. 23» PENNANT, Arct. Zool. (1784) p. CXV. — *Andromeda taxifolia* PALLAS, Fl. Ross. I: 2, p. 54 quoad pl. Kamtsch. pro parte. — *Erica coerulea* GEORGI, Beschreib. III: 4 p. 936. — *Andromeda Daboesia* MERTENS, Bemerk. Fl. Koragins p. 65. — *Phyllodoce taxifolia* SALISB., Ledeb., Fl. Ross. II p. 916; MAXIM., Rhododendr. Sibir. orient. p. 6. — ?*Erica* DITMAR, Reisen I pp. 489, 540.

South Kamtchatka: Mt. »Babi Kamen», Paratunka KOMAROV 1908; Glinini mts. RUBINSKI 1909; mt. Palovinaja, Savoiko July 8th 1920 HN No. 315 b, do. July 14th 1928 W. EYERDAM, do. July 22nd 1928 MALAISE; the Korjaka valley RUBINSKI 1908; Poperochnaja R. KOMAROV 1908.

East Kamtchatka: Mt. Saraj, Avatcha volcano 3000 feet PERFILJEF 1909; Avatcha volcano 900 m. July 30th 1920 HN No. 580; Lake Kronoki Sept. 12th 1921 HN No. 3586 (MALAISE); Klutchevskaja volcano BEZAIS 1908, do. Aug. 6th 1927 MALAISE.

Commander Islands: Copper Island DYBOVSKY.

Central Kamtchatka: The Ganala Tundra GRINOP 1909 (mixed with the hybrid); Anauna R. Aug. 19th 1926 MALAISE No. 411, do. Sept. 5th 1926 MALAISE No. 412; Klutchi AFANASEJEF 1909.

West and North Kamtchatka: Between Sedanka and Jelovka BEZAIS 1909 (mixed with the hybrid); Karaginsk Island MERTENS, do. LOGINOVSKI; Cape Ugolnaja 61° 0′ 16″ BJELOUSSOF 1914.

Ph. coerulea is apparently not rare in the alpine region of the northern part of the Kamtchatka Peninsula. To the south it is replaced by the hybrid with *Ph. aleutica* and by the latter species. For a discussion on the differences between it and *Ph. aleutica* and the hybrids see under *Ph. aleutica* × *coerulea*.

Type of distribution: ?

Geographical area: Europe: The Scandinavian mts. from the North Coast to southern Norway; Kola penins., a few localities in Scotland and the Pyrenees.

Asia: some few localities in the northern Urals and near Obi Bay, around the southern end of Lake Baikal and in Transbaikalia, Bureja R., Ajan, Saghalin, Yezo and the southern Kuriles, Kamtchatka, Commander Islands and Chukch Penins. America: Alaska (62° N. lat.), southern Baffin Land and northern Labrador, the Gaspé penins. and in the mts. southwards to New Hampshire (44° N. lat.). W. Greenland to about 74° N. lat. E. Greenland to about Scoresby Sound. E. Busch loc. cit. p. 48 gives a map of the area of this species. In that map it is marked as being found in the Alps, where *Ph. coerulea* is not known. Localities on Yezo should be added to the map. In Kamtchatka the species is marked in the southern part, whereas it chiefly inhabits the northern part of the peninsula. A map of the whole distribution is given by Rikli loc. cit., to which should be added localities in Kamtchatka and the Commander Islands.

Kalmia glauca Ait.

Asa Gray in Proc. U. S. Nat. Mus. VII (1884) p. 528; Stejneger in Proc. U. S. Nat. Mus. VII (1884) p. 535. — *Kalmia polifolia* Fedtsch., Fl. Îl. Comm. p. 84; Kuznets. in Fl. As. Ross. 9 (1916) p. 57.

Asa Gray and Stejneger loc. cit. reports this plant as collected by Stejneger on both Bering and Copper Island. The report is given without any remark and a confirmation would be desirable, but as far as I can see there is no reason to doubt it. There was recently described a new *Kalmia*-species with the distribution from Alaska to Washington — *K. occidentalis* Small — and it is therefore hardly possible to say without access to Stejneger's specimens whether they should be referred to it or to *K. polifolia* Wangenh.

611. ***Bryanthus Gmelini*** D. Don in Edinb. New Phil. Journ. XVII (1834) p. 160.

DC., Prodr. VII p. 712; Ledeb., Fl. Ross. II p. 916; Maxim., Rhododendr. As. orient. p. 4; Herder, Pl. Radd. Monopet. No. 39 in Acta Horti Petrop. I: 2 (1872) p. 335 et Radde, Reisen IV: 1 p. 53; Fedtsch., Fl. Îl. Comm. p. 86; Kom., Voy. Kamtch. pp. 415, 455 et Fl. Penins. Kamtsch. II p. 365; E. Busch in Fl. Sib. Orient. extrem. II (1915) p. 50 et fig. p. 51; Kuznets. in Fl. As. Ross. 9 (1916) p. 35 fig. 12; Kudo, Fl. Paramush. p. 143. — »*Bryanthus T. LVII. 3 Planta Ericae adfinis, repens, serpyllifolio . . .*» Gmel., Fl. Sib. IV p. 133. — »*Bryanthus* Gm. Sib. IV 133 No. 23» Pennant, Arct. Zool. (1784) p. CXV. — *Andromeda Bryanthus* L., Mant. (1771) p. 238; Pallas, Fl. Ross. I: 2 p. 57 et tab. LXXIV fig. 1; Poir., Encycl. Mét. Bot. Suppl. I (1810) p. 353. — *Erica Bryantha* Georgi, Beschreib. III: 4 p. 935. — *Bryanthus musciformis* Nakai, Trees and shrubs indigenous in Jap. prop. I (1922) p. 16 fig. 7 (non vidi); Nakai in Bot. Mag. Tokyo 38 (1924) p. 23.

Northern Kuriles: Paramushir Kudo 1920.

South Kamtchatka: N. of Ozernaja village in heath noted by Hn; between Javina and Kochegochek Rubinski 1909; between the arms of Kochegochek rivers noted in A. 90 b; W. of Sholtovskaja volcano noted by Hn; Shadutka volcano 1125 m. Aug. 2nd 1921 Hn No. 2597; near Shadutka volcano

noted in A. 82; Topik 470 m. noted by Hn; Assatcha mts. 1125 m. noted by Hn; Gorelaja volcano noted in A. 164, A. 166, A. 170; Opala volcano 620 m. July 21st 1921 Hn No. 2266, do. 1040 m. July 21st 1921 Hn No. 2311, do. noted in A. 70 a; Lake Tolmachovaja noted in A. 159; between Opala volcano and Lake Tolmachovaja noted in A. 158; upper Tolmachovaja R. noted by Hn; mt. »Babi Kamen», Paratunka Komarov 1908; mt. Tshapochka, Natchika Komarov 1908.

East Kamtchatka: Avatcha volcano Perfiljef 1909, do. 1000 m. Aug. 2nd 1920 Hn No. 703, do. 1300 m. Aug. 2nd 1920 Hn No. 713; the Pinatcheva Pass Novograblenof 1928 acc. to Kom. loc. cit.; near the mouth of Kamenuchka R. Komarov 1909; between Kichpinitch volcano and Uzon Komarov 1909; Uzon Komarov 1909; the Kronoki Pass Komarov 1909; the Chartchina mts. Aug. 12th 1927 Malaise.

Commander Islands: Bering Island Stellee acc. to Gmel. loc. cit., Kjellman, Grebnitzky 1894 and acc. to Fedtsch. loc. cit. Stejneger and Morozevicz; Copper Island Stejneger acc. to Fedtsch. loc. cit.

Central Kamtchatka: the foot of Korjatskaja volcano Komarov 1908 (Hb. Berol.); Korjatskaja volcano Aug. 14th 1928 W. Eyerdam; mt. Aak Komarov 1908; Ganala Kittlitz; Anauna R. Aug. 19th 1926 Malaise No. 407.

West and North Kamtchatka: Utka Rubinski 1908 acc. to Kom. loc. cit.; between Sedanka and Jelovka Bezais 1909.

»Kamtchatka»: »Hb. Steller», Kegel, »Petropavlovsk Mertens», Peters. The specimen figured by Pallas, now in Hb. Acad. Petrop., was originally labelled »*Andromeda Bryanthus* Kamtschatka», later was added »Hb. Pallas, Herb. Fischer», and lately (in Russian) »collected by Merk on Avatchinskaja sopka». The last remark is apparently not correct.

Noted in the following associations:

In *Vaccinium—Empetrum*—Lichen ass.:
Sparse (A. 70 a, A. 82, A. 90 b, A. 158); Scattered (A. 159).

In *Vaccinium—Diapensia*—Lichen ass.:
Sparse (A. 170); Abundant (A. 164, A. 166).

In South Kamtchatka *Bryanthus Gmelini* is comparatively common on the heaths of the high-alpine region. It flowers from the end of July to the end of August.

Bryanthus Gmelini is a pretty, peculiar little plant of Pacific northern Asia which has often been much misunderstood in literature. The genus *Bryanthus* was first established by Gmelin in Fl. Sib. IV p. 132 and the only species known to him belonging to the new genus was our plant, which he illustrated in Tab. LVII fig. 3. Unfortunately, however, the description of the new genus differs in several very important points from the plant on which it was founded. Thus, the capsules are said to be five-celled and the corolla to be campanulate, divided below the middle into 4—6 lobes. *Bryan-*

thus Gmelini has, however, four-celled capsules and a corolla of four ovate separate leaves. After GMELIN later authors give similar more or less erroneous descriptions of the genus *Bryanthus*, until MAXIMOWICZ in Rhododendr. As. Orient. p. 4 gives a practically correct description of it. Even MAXIMOWICZ, however, seems not to have realized that the corolla consists of four separate petals, and DRUDE, following MAXIMOWICZ in ENGLER & PRANTL. Nat. Pflanzenf. IV: 1 p. 38, placed the genus *Bryanthus* in the group with connate corolla. All the flowers that I have seen were tetramerous. Several *Phyllodoce*-species have at different times been referred to the genus *Bryanthus*, and this has certainly been due to the inaccurate description. Of the true genus *Bryanthus*, however, only one species has so far been known.

The first binominal name of our plant was *Andromeda Bryanthus*, given by LINNAEUS. When the plant is referred to the genus *Bryanthus* its name cannot be *Bryanthus Bryanthus*, and thus DON's name *Bryanthus Gmelini* must be used. LEDEBOUR, and after him later authors, cite »*Andromeda musciformis* POIR, Encycl. Méth. Suppl. I, p. 353» as a synonym of our plant, and as the Supplement to Encycl. Méth. was already published in 1810, while DON's name was published in 1834, the question might arise as to whether the combination *Bryanthus musciformis* might not — as NAKAI loc. cit. suggests — be the correct name of our plant. POIRET, however, writes: »*Andromede musciforme* No. 7 *Andromeda briantha* LINN.» He thus uses the name »*musciforme*» only as the French name of the plant and the Latin name used by him is »*Andromeda briantha*». The name *Bryanthus musciformis* cannot therefore be used.

Although *Bryanthus Gmelini* has often been illustrated, no detailed illustration has been given of its flowers and capsules and as moreover it represents a very interesting and peculiar type I here give a picture of them, drawn partly from living specimens (Pl. 1 figs. a—e).

Our plant was reported by STELLER as occurring in Ochotsk, a report that is also repeated by BUSCH and KUZNETSOF in the two modern Russian floras on Eastern Asia.

In view of the fact that STELLER's plants were apparently often incorrectly labelled — he probably did not label them himself as he died on his way back to Russia — this report is probably wrong and in any case highly in need of confirmation. The plant is not known from Saghalin or Amur prov., nor from Gishiginsk or the Chukch Penins.

Type of distribution: Asiatic-Pacific.

Geographical area: From northern Kamtchatka over Commander Islands and the Kuriles to the mts. of Yezo and Honshu. On the map given by E. BUSCH loc. cit. should thus be added the localities in Japan, and the locality at Ochotsk should most probably be excluded.

E. BUSCH loc. cit. p. 140 enumerates *Bryanthus Gmelini* as one of the three *Ericaceae*-species endemic in Siberia. This is not the case, as the plant occurs also in Japan. It has the distribution typical for the group of plants hat I call Asiatic-Pacific.

Cassiope ericoides (PALL.) DON.

LEDEB., Fl. Ross. II p. 913; HERDER, Pl. Radd. Monopet. No. 36 in Acta Horti Petrop. I: 2 (1872) p. 339 et RADDE, Reisen IV: 1 p. 50; E. BUSCH in Fl. Sib. Orient. extrem. I (1915) p. 61; KUZNETS. in Fl. As. Ross. 9 (1916) p. 39.

»Kamtchatka»: »Hb. STELLER» (Hb. Acad. Petrop.); »Hb. LEDEB. In Camtschatka legit dt. am. TILESIUS Petrop. 13» (Hb. Hort. Bot. Petrop.); »Herb. FISCHER *Cassiope ericoides* DON» later added »KEGEL, Kamtschatka» (Hb. Hort. Petrop.); »*Andromeda ericoides* Camtschatka Herb. H. F. LINK» (Hb. Berol.); *Andromeda ericoides* PALL. Kamtschatka (printed label with the written addition: »misit BONGARD 1837») (Hb. Holm.); MERTENS and STUBENDORFF acc. to BUSCH loc. cit. The reports of TILING and MAYDELL as collectors of this species in Kamtchatka made by KUZNETSOF loc. cit. apparently refers to the Kamtchatka province and not to the peninsula.

In spite of all the above-enumerated reports I think it must be regarded as very doubtful whether *C. ericoides* occurs on the Kamtchatka Peninsula. It is common in Ochotsk, which belongs to the »Kamtchatka province» and probably all reports thus refer to that province and not to the Kamtchatka peninsula. (Compare HULTÉN, Fl. Kamtch. I pp. 6, 7.) On the map given by BUSCH loc. cit. the species is marked as occurring in South Kamtchatka, where I did not find it during 3 years of travelling there. If it occurred on the peninsula it might be expected in the northern part.

The species should probably be excluded from the flora of our area.

612. ***Cassiope lycopodioides*** (PALL.) D. DON. in Edinb. New Phil. Journ. XVII (1834) p. 158.

DC., Prodr. VII p. 610; LEDEB., Fl. Ross. II p. 912; HERDER, Pl. Radd. Monopet. No. 32 in Acta Horti Petrop. I: 2 (1872) p. 329 et RADDE, Reisen IV: 1 p. 47; MIYABE, Fl. Kuril. p. 247; YABE & YENDO, Fl. Shimushu p. (191); FEDTSCH., Fl. Îl. Comm. p. 85; KOM. Voy. Kamtch. pp. 69, 344, 415 et Fl. Penins. Kamtsch. I p. 333; E. BUSCH in Fl. Sib. Orient. extrem. II (1915) p. 54 et fig. p. 55; KUZNETS. in Fl. As. Ross. 9 (1916) p. 42; KUDO, Fl. Paramush. p. 143. — »*Erica foliis acerosis, glabris imbricatis . . .*» GMEL., Fl. Sib. IV p. 130. — »*Erica* GM. Sib. IV 130 No. 21» PENNANT, Arct. Zool. (1784) p. CXV. — *Andromeda lycopodioides* PALLAS, Fl. Ross. I: 2 p. 55 et tab. LXXIII fig. 1; GEORGI, Beschreib. III: 4 p. 959.

Northern Kuriles: Paramushir M. AIZAWA 1900, T. MATSUBARA 1915, KUDO 1920 all acc. to KUDO loc. cit.; Shumshu acc. to MIYABE and YABE & YENDO loc. cit.

South Kamtchatka: Lopatka RIEDER 1831; »E. side of Lopatka at Pakiusiu R.» VOSSNESENSKI 1847; Illina volcano 500 m. noted by HN; Shadutka volcano 1125 and 1260 m. noted by HN; Rukavitchkin Bay RIEDER 1831; Akhomten Bay 330 m. Sept. 11th 1920 HN No. 1287 (A. 36 a, A 36 b); Mutnovskaja volcano up to 1460 m. noted by HN; Gorelaja volcano noted in A. 164, A. 166, A. 168, A. 170, A. 171; Opala volcano 620 m. July 23rd 1921 HN No. 2352, do. 1100 m. July 21st 1921 HN No. 2297; mt. »Babi Kamen»

(Paratunka R.) Komarov 1908; mt. »Zaikin mys» (Paratunka) Komarov 1908; mt. Trubi Komarov 1908 (Hb. Berol.); Lake Natchika Komarov 1908; Mt. Saraj Shalsan R. Komarov 1908; Shalsan Vossnesensky 1848; Ozdets R. Komarov 1908; Mt. Tshapochka, Natchika, Komarov 1908; Poperochnaja R. Komarov 1908; mt. Palovinaja 800 m. July 8th 1920 Hn No. 316, do. July 14th 1928 W. Eyerdam, do. July 22nd 1928 Malaise; middle Korjatskaja R. Rubinski 1908.

East Kamtchatka: Avatcha volcano 900 m. July 30th 1920 Hn No. 632; the Penichivo Pass July 28th 1928 W. Eyerdam; Kichpinitch volcano Komarov 1909; mt. Krascheninnikoff Komarov 1909; Uzon Komarov 1909 (Hb. Berol.); Lake Kronoki 900 m. Sept. 12th 1921 Hn No. 3583 (Malaise); Klutchevskaja volcano 3600 feet Bezais 1908, do. 3200 feet Kozlovsky 1909; the Chartchina Mts. Aug. 12th 1927 Malaise.

Commander Islands: Bering Island Steller, Kjellman and acc. to Fèdtsch. loc. cit. Stejneger and Grebnitzky; Copper Island Dybovsky, Stejneger, Dobrotvorsky, Tilman, Grebnitzky and Morozevicz all acc. to Fedtsch. loc. cit., Tkatchenko July 25th 1911 (Hb. Holm.).

Central Kamtchatka: The foot of Korjatskaja volcano Komarov 1908 (Hb. Berol.); Ganala Stewart; the sources of Kashkan R. Komarov 1909; between Sharomsk and Vershne Kamtchatsk Protopopof 1908; Anauna R. Aug. 19th 1926 Malaise No. 409; Klutchi Afanasajev 1909.

West and North Kamtchatka: Between Sedanka and Jelovka Bezais 1909.

»Kamtchatka»: Without country »Steller Hb. Pallas, Hb. Fisch.», Kegel, Stewart, Kusmischeff (Hb. Berol.) »Petropavlovsk Mertens», Peters, Rieder (Hb. Berol.).

Noted in the following associations:

In *Vaccinium—Diapensia*—Lichen ass.:
Single (A. 164, A. 166, A. 168, A. 170).

In *Artemisia arctica—Rhododendron kamtschaticum—Salix »arctica»* ass.:
Single (A. 36 a, A. 36 b); Sparse (A. 171).

In the alpine heaths of South Kamtchatka *C. lycopodioides* is a common plant.

Type of distribution: Northern Pacific.

Geographical area: Asia: Kamtchatka, Commander Islands, the Kuriles, Yezo, southern Saghalin and Honshu. The reports from Ochotsk by Steller and Erman are probably incorrect and are not cited by later Russian authors; moreover, the report from the Chukch Penins. (Port Providence) by Dobrotvorsky, is doubtful and in need of confirmation. America: the Aleutian Islands, S. coast of Alaska. On the map given by E. Busch loc. cit. must thus be added localities in Alaska, Japan and on Saghalin.

Cassiope Redowskii (CHAM. & SCHLECHT.) DON.

HERDER, Pl. Radd. Monopet. No. 33 in Acta Horti Petrop. I: 2 (1872) p. 333 et RADDE, Reisen IV: 1 p. 48; KUZNETS. in Fl. As. Ross. 9 (1916) p. 41.

This species is reported from Kamtchatka as collected by REDOWSKY who, however, never reached the peninsula. KUZNETSOF also reports MERTENS as having collected the plant in Kamtchatka. *C. Redowskii* should certainly be excluded from the flora of our area.

613. ***Cassiope Stelleriana*** (PALL.) DC., Prodr. VII (1839) p. 611.

LEDEB., Fl. Ross. II p. 913; HERDER, Pl. Radd. Monopet. No. 38 in Acta Horti Petrop. I: 2 (1872) p. 334 et RADDE, Reisen IV: 1 p. 52; KOM., Voy. Kamtch. p. 415; E. BUSCH in Fl. Sibir. orient. extrem. II (1915) p. 66; KUDO, Fl. Paramush. p. 144. — *Andromeda Stelleriana* PALLAS, Fl. Ross. I: 2 (1790) p. 58 et tab. LXXIV fig. 2. — *Harrimanella stelleriana* (PALL.) COVILLE in Prov. Wash. Ac. Sc. III (1901) p. 574; FEDTSCH., Fl. Îl. Comm. p. 85; KUZNETS. in Fl. As. Ross. 6 p. 46.

Northern Kuriles: Paramushir KUDO 1920 acc. to KUDO loc. cit.

South Kamtchatka: Opala Volcano 1100 m. July 21st 1921 HN No. 2296; mt. Trubi, Vilju R. KOMAROV 1908; Poperochnaja R. KOMAROV 1908; mt. Krasnaja Aug. 10th 1928 KOMAROV.

East Kamtchatka: The hot springs of Nalutcheva July 31st 1928 P. T. NOVOGRABLENOF; the N. foot of Kichpinitch volcano KOMAROV 1909; Uzon KOMAROV 1909; the Kronoki Pass KOMAROV 1909 (Hb. Berol.).

Commander Islands: Bering Island STELLER acc. to PALLAS loc. cit.

Central Kamtchatka: Mt. Zerkalo, Malka July 27th 1924 NOVOGRABLENOF, upper Gremushej R. KOMAROV 1908; mt. Aak KOMAROV 1909 (Hb. Berol.).

»Kamtchatka»: »*Andromeda Stelleriana* Nov. Sp. Kamtchatka PALLAS Herb. FISCH.» (Hb. Hort. Bot. Petrop.), PETERS.

In South Kamtchatka this plant is apparently rare. It occurs in the heath of the alpine region and flowers in July.

Type of distribution: Northern Pacific.

Geographical area: Asia: E. and S. Kamtchatka, Commander Islands, the northern Kuriles, isolated localities on Yezo and Honshu. (The report from Ishiga in HERDER loc. cit. is certainly incorrect.) America: the Aleutian Islands and along the coast to Washington. A detailed account of the American distribution is given by COVILLE loc. cit. To the map given by E. BUSCH must be added localities on Yezo and Honshu.

614. ***Cassiope tetragona*** (L.) D. DON in Edinb. New Phil. Journ. XVII (1834) p. 158.

E. BUSCH in Fl. Sib. Orient. extr. II (1915) p. 58. — [*Andromeda tetragona* L., Sp. pl. ed. I (1753) p. 393]; GEORGI, Beschreib. III: 4 p. 957.

Central Kamtchatka: Anauna R. Aug. 19th 1926 MALAISE No. 408, do. Sept. 5th 1926 MALAISE No. 410; the Chartchina mts. »Timaska» (opposite Klutchi) PROTOPOPOF 1909; the Chartchina mts. Aug. 12th 1927 MALAISE.

»Kamtchatka»: »E. Kamtschatka TILESIUS Herb. SWARTZII» (Hb. Holm.), »E. Kamtschatka — a celeberrimo Prof. SWARTZ Holm. 9 nov. 1814» (Hb. Holm.).

This plant has apparently a northern distribution within our area. GEORGI also reports it from Bering Island. This probably in his interpretation of some of the reports of »*Erica*» made by STELLER in his manuscript catalogue of the plants growing in Bering Island.

Type of distribution: Circumpolar.

Geographical area: Europe: Spitzbergen, northernmost Scandinavia, Umptek mts. Kola Penins., the northernmost Urals and Dolgoi Island (Jugor Shar). Asia: along the North Coast to Chukch Penins., southwards in the mts. to northern Transbaikalia, southern Jakutsk prov. and central Kamtchatka. America: from Alaska to Ellesmereland, Baffin Land and Labrador, southwards to Vancouver Island and mts. of British Columbia. Greenland except southern part (from about 64° N. lat.).

On the map of the Eurasiatic part of the area given by E. BUSCH loc. cit. on Iceland are marked out several localities for our species which, however, is not, as far as I am aware known from there. The Kamtchatka locality is placed on South Kamtchatka, although our plant is not known from the southern part of the peninsula. A review of the distribution is given by RIKLI in Bot. Jahrb. 50 Suppl. (1914) p. 268.

615. ***Andromeda polifolia*** L., Sp. pl. ed. I (1753) p. 393.

PALLAS, Fl. Ross. I: 2 p. 53; GEORGI, Beschreib. III: 4 p. 958; MERTENS, Bemerk. Fl. Koragins p. 62; LEDEB., Fl. Ross. II p. 910; HERDER, Pl. Radd. Monopet. No. 30 in Acta Horti Petrop. I: 2 (1879) p. 326 et RADDE, Reisen IV: 1 p. 44; YABE & YENDO, Fl. Shimushu p. (190); FEDTSCH., Fl. Îl. Comm. p. 84; KOM., Voy. Kamtch. pp. 233, 454; E. BUSCH in Fl. Sib. Orient. extr. II (1915) p. 72 (var. *typica*, var. *pusilla*, var. *latifolia*); KUZNETS. in Fl. As. Ross. 9 (1916) p. 48; KUDO, Fl. Paramush. p. 194.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka W. coast June 19th 1920 HN No. 39, the junction of Golygina rivers noted in A. 111; Akhomten Bay Sept. 10th 1920 HN No. 1252; upper Abshen R. noted in bog by HN; near the mouth of Bolshaja R. July 5th 1921 HN No. 1967 (A. 45, A. 48 b, A. 49, A. 50 b, A. 51); lower Bolshaja R. noted in A. 109 a, A. 110; near the mouth of Ipelka R. noted in A. 58, A. 59 a, A. 59 b; S. of Bolsheredsk noted in bog by HN; Apatcha noted in bog by HN; Siku R. noted in bog by HN; the Paratunka »tundra» KOMAROV 1908, do. RUBINSKI 1908; Tishaja KOMAROV 1908; Hutor July 22nd 1928 W. EYERDAM; Lake Natchika KOMAROV 1908.

East Kamtchatka: Petropavlovsk June 16th 1928 W. Eyerdam; between Petropavlovsk and Savoiko July 9th 1920 Hn No. 397; between Petropavlovsk and Avatcha volcano 350 m. June 24th 1921 Hn No. 1817 (A. 20, A. 21); Ustj-Kamtchatsk July 18th 1927 Malaise.

Commander Islands: Bering Island Steller acc. to Pallas loc. cit., Grebnitzky and Stejneger acc. to Fedtsch. loc. cit., Gudzenko 1910; Copper Island Dybovsky, Grebnitzky and Morozewicz all acc. to Fedtsch. loc. cit.

Central Kamtchatka: Between Kirganik and Mashura acc. to Kom. loc. cit.; Ushki Protopopof 1909.

West and North Kamtchatka: Krutugorovaja Bezais 1909; Oblukovina Rubinski 1908; Tigil Levitzky; Karaginsk Island Mertens.

»Kamtchatka»: »Hb. Pallas», »Hb. Fischer», Merk, Kusmischeff, Peters, Rieder, and acc. to Busch loc. cit. Stubendorff.

Noted in the following associations:

In *Carex—Rubus chamaemorus—Vaccinium—Empetrum* ass.:
Single (A. 45, A. 49, A. 51, A. 58, A. 59 a, A. 59 b, A. 109 a).

In *Carex—Myrica—Sphagnum* ass.:
Sparse (A. 20, A. 111).

In *Carex—Myrica* ass.:
Single (A. 21, A. 110).

A. polifolia is common in the bogs of South Kamtchatka. It flowers from the middle of June to the end of July.

The plants vary somewhat, especially in the size and breadth of the leaves. Some of them belong to the arctic form f. *acerosa* Hartm.

Type of distribution: Circumpolar.

Geographical area: Europe: from Scotland, northernmost Scandinavia, Kola Penins. and northern Russia, southwards to the Pyrenees (rare in W. France and in England), northern Italy and central Russia. Asia: from the mouth of Obi R. to Chukch Penins., southwards to southern Tobolsk prov., northern Mongolia, Ussuri and Honshu. America: Alaska to Labrador, southwards to Quebec, the Great Lakes, Idaho and Washington. W. Greenland only one report from about 62° N. lat. Not known from E. Greenland, Iceland or Spitzbergen, which latter localities must thus be excluded from the map of the area in Busch loc. cit.

616. ***Arcterica nana*** (Maxim.) Makino in Bot. Mag. Tokyo 20 (1906) p. 85.

E. Busch in Fl. Sib. Orient. extr. II (1915) p. 69; Kuznets. in Fl. As. Ross. 9 (1916) p. 55. — *Andromeda (Portuna) nana* Maxim. in Mél. Biol. VIII (1872) p. 615 et in Bull. Ac. Imp. St. Petersb. XVIII (1873) p. 47; Fedtsch., Fl. Îl. Comm. p. 84. — *Cassiope oxycoccoides* A. Gray in Proc. Am. Acad. XX (1885) p. 300. — *Pieris nana* Makino in Bot. Mag., Tokyo 8 (1894) p. 213; Yabe & Yendo, Fl. Shimushu p. (190). — *Arcterica oxycoccoides* Coville in Proc. Acad. Sc.

Wash. 3 (1901) p. 573; Coville in Bot. Gaz., Chicago XXXVII (1904) p. 298. — »*Pieris nana*(?)» Yabe in Bot. Mag., Tokyo 18 (1904) p. 127.

Northern Kuriles: Shumshu Yendo 1903 acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka east coast June 17th 1920 Hn No. 139 b; Opala volcano July 21st 1921 Hn No. 2268 b; mt. »Babi kamen», Paratunka Komarov 1908; mt. »Zaikin mys», Paratunka June 28th 1924 P. T. Novograblenof, mt. Trubi, Viljŭ R. Komarov 1908 (in Hb. Acad. Petrop. included in a sheet of *Oxytropis revoluta*); mt. Tshapochka, Natchika Komarov 1908.

Commander Islands: Bering Island Aug. 14th 1742 Steller acc. to Kuznetsof loc. cit. (it would be of interest to know from where this report originates); Stejneger 1882 acc. to Asa Gray loc. cit.

»Kamtchatka»: Included in a sheet of *Loiseleuria procumbens* labelled »Kamtschatka Herb. Trautvetter» in Hb. Hort. Bot. Petrop.; Kusmischeff (sub *Vaccinium vitis idaea* β *microphyllum* in Herb. Hort. Bot. Petrop.); Peters 1831; Rieder (sub »*Vaccinium vitis idaea?*»).

The frequency of this very peculiar little plant in South Kamtchatka is still unclear. The only time I collected it in full flower was three days after my first arrival in Kamtchatka at Cape Lopatka and I did not then especially notice it, as in habitus it very much resembles *Vaccinium vitis idaea* var. *microphylla*. The fact, however, that it could be found in several cases included in old herbarium-sheets of other heathers collected in South Kamtchatka (compare the list above) indicates that it is not rare in the alpine region there. A botanist aware of its existence and acquainted with the characteristics in which it differs from *Vaccinium vitis idaea* would probably find it in many places. When in flower it is easily distinguishable from *Vaccinium vitis idaea* by the more closed flowers and large petals, while in sterile specimens the difference is less pronounced. In the leaves of *Arcterica*, however, the groove on their back along the median vein is much deeper than that of *Vaccinium*. The leaves are also somewhat more involute in the margin and, especially when young, slightly pubescent. After some training it is possible to pick out a sterile twig of *Arcterica* included in a sheet of *Vaccinium vitis idaea*.

Our plant was first described by Maximowicz in 1872 as *Andromeda nana*. In 1885 it was once more described by Asa Gray, who did not know Maximowicz' species, as *Cassiope oxycoccoides*. In 1895 Makino referred Maximowicz' species to the genus *Pieris*, and in 1904 Coville based his genus *Arcterica* on Asa Gray's species. In the same year Yabe pointed out that Makino's *Pieris nana* and Coville's *Arcterica oxycoccoides* were identical, and if the plant should be referred to a genus of its own its name should be *Arcterica nana*, as Makino stated two years later.

Type of distribution: Asiatic-Pacific.

Geographical area: Commander Islands, South Kamtchatka, the Kuriles, mts. of Yezo and Honshu.

617. ***Chamaedaphne calyculata*** (L.) MOENCH, Meth. (1794) p. 457.

[*Andromeda calyculata* L. Sp. pl. ed. I (1753) p. 394]; PALL., Fl. Ross. I: 2 p. 53; GEORGI, Beschreib. III: 4 p. 958; MERTENS, Bemerk. fl. Koragins p. 65. — *Cassandra calyculata* HERDER, Pl. Radd. Monopet. No. 31 in Acta Hort. Petrop. I: 2 (1872) p. 328 et RADDE, Reisen IV: 1 p. 46. — *Lyonia calyculata* (L.) REICH., E. BUSCH in Fl. Sibir. Orient. extrem. II p. 78—80 et III p. 81—83; KUZNETS. in Fl. As. Ross. 9 (1916) p. 52.

South Kamtchatka: The mouth of Artemjeva R. noted in A. 220; lower Bolshaja R. noted in A. 109 a, A. 109 b, A. 110; near the mouth of Bolshaja R. noted in A. 45, A. 46, A. 51; near the mouth of Ipelka R. noted in A. 58; Bolsheredsk RIEDER 1833; Apatcha KOMAROV 1908, do. June 17th 1922 HN No. 3815; small lakes near Paratunka KOMAROV 1908; near Mikisha KOMAROV 1908; Nikolajevsk KOMAROV 1908, do. RUBINSKI 1908; Savoiko July 6th 1928 W. EYERDAM.

East Kamtchatka: The Kalashtyrka valley KOMAROV 1909 (Hb. Berol.); between Petropavlovsk and Savoiko July 9th 1920 HN No. 378.

Central Kamtchatka: Svetloj klutch R. May 26th 1925 MALAISE No. 506; between Mashura and Kronoki Okt. 2nd 1921 HN No. 3620 (MALAISE).

West and North Kamtchatka: Karaginsk Island acc. to MERTENS loc. cit.

Noted in the following associations:

In *Carex—Rubus chamaemorus—Vaccinium—Empetrum* ass.:

Single (A. 45, A. 46, A. 51, A. 109 a, A. 109 b, A. 220).

In *Carex—Myrica* ass.:

Single (A. 110).

The distribution of this plant in Kamtchatka is somewhat unclear. In South Kamtchatka it is not uncommon in the *Sphagnum*-bogs of the cross-valley Petropavlovsk—Bolsheredsk. It flowers from the end of May to the beginning of July.

Type of distribution: ?

Geographical area: Europe: from northernmost Sweden (on the Finnish border), northern Finland and northernmost Russia southwards to Eastern Russia, northern Poland, Thula, Saratow and southern Perm provinces. Asia: at Yenisej from about 69° N. lat., from the mouth of Lena and Kolyma rivers and from Anadyr, southwards to southern Jakutsk and Yeniseisk provinces, Transbaikalia, Amur prov. and Yezo. America: from Alaska (reported from Kotzebue Sound) to Labrador and Newfoundland southwards to British Columbia, Minnesota, Illinois and Georgia. A map of the Eurasiatic area is given by BUSCH loc. cit., to which should be added localities on Yezo and southern Saghalin.

Gaultheria Miqueliana TAKEDA.

KUDO, Fl. Paramush., p. 145.

Northern Kuriles: Paramushir »Sine loco indicato (N. HASHIMOTO 1908)» acc. to KUDO loc. cit.

As other reports founded on HASHIMOTO's specimens are apparently doubtful I think that this also is in need of confirmation. *G. Miqueliana* is a Japanese species known acc. to KUDO 1925 northwards to Saghalin and the southern Kuriles, and might of course extend as far as to Paramushir.

618. ***Arctostaphylos alpina*** (L.) SPR. in L., Syst. Veg. II ed. XVI (1825) p. 287.

LEDEB., Fl. Ross. II p. 908; HERDER, Pl. Radd. Monopet. No. 28 in Acta Horti Petrop. I: 2 (1872) p. 323 et RADDE, Reisen IV: 1 p. 41; YABE & YENDO, Fl. Shimushu p. (190); FEDTSCH., Fl. Îl. Comm. p. 83; KOM., Voy. Kamtch. pp. 344, 351, 454. — [*Arbutus alpina* L., Sp. pl. ed. I (1753) p. 566]; PALLAS, Fl. Ross. I: 2 p. 48; MERTENS, Bemerk. Fl. Koragins. p. 62. — ?»*Uva ursi*» STELLER in PALLAS, Neue Nord. Beytr. II (1781) p. 300. — *Arctous alpina* (L.) NIEDENZ., E. BUSCH in Fl. Sibir. Orient. extrem. III p. 88; KUZNETS. in Fl. As. Ross. 9 (1916) p. 61; KUDO, Fl. Paramush. p. 145.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka VOSSNESENSKY acc. to BUSCH loc. cit., do. collected by cossacks (Hb. Hort. Bot. Petrop.), do. June 17th 1920 HN No. 9; N. of Ozernaja village noted by HN; Illina volcano 650 m. noted by HN; between Javina and Kochegochek noted in A. 94; between the branches of Kochegochek R. noted in A. 90 b; Kochegochek noted in A. 213; between the mouths of Kochegochek and Golygina rivers noted in A. 102; lower Golygina R. noted by HN; S. of Golygina village noted by HN; between the mouths of Golygina and Opala rivers noted by HN; Shadutka volcano 1260 m. noted by HN; near Shadutka volcano noted in A. 82; the Savan mts. 700 m. noted in A. 78 c; Topik noted in *Pinus pumila* thickets by HN; Assatcha mts. 1125 m. noted by HN; Gorelaja volcano noted in A. 164, A. 166, A. 168; Opala volcano 1300 m. noted by HN; do. 1040 m. Aug. 21st 1921 HN No. 2353 (A. 70 a); Lake Tolmachovaja noted in A. 160; between Opala and Lake Tolmachovaja noted in A. 158; Danilina R. 100 m. July 14th 1921 HN. No. 2151; near the mouth of Ipelka R. noted in A. 58, A. 59 a; between Bolsheredsk and Apatcha KOMAROV 1908; Haikovaja village June 9th 1922 HN No. 3783; mt. »Baranja» on the right side of Bannaja R. RUBINSKI 1908; mt. »Babi kamen», Paratunka, KOMAROV 1908; mt. »Zaikin mys» Paratunka, KOMAROV 1908; mt. »Krasni gor», Natchika, KOMAROV 1908; Uzdets R. KOMAROV 1908.

East Kamtchatka: Between Petropavlovsk and Avatcha volcano 330 m. Aug. 24th 1920 HN No. 1064; Avatcha volcano Aug. 24th 1928 W. EYERDAM; Semjatchik acc. to KOM. loc. cit.; mt. Krascheninnikof acc. to KOM. loc. cit.; Cape Kozlof June 28th 1923 MALAISE; Lake Kronoki 900 m. Sept. 12th 1921 HN No. 3574 (MALAISE); Ploskaja volcano PROTOPOPOF acc. to BUSCH loc. cit.

Commander Islands: Bering Island STELLER acc. to FEDTSCH. loc. cit., KJELLMAN, GREBNITZKY 1894 and acc. to FEDTSCH. loc. cit. STEJNEGER; Cop-

per Island Dybovsky 1879 and acc. to Fedtsch. loc. cit. Stejneger and Morozevicz.

Central Kamtchatka: Korjatskaja volcano Aug. 14th 1928 W. Eyerdam; Malka and Ganala Stewart; Shtchapina acc. to Kom. loc. cit.; mt. Kunchekla Protopopof 1909; »Kruki» Baidarka R. Protopopof 1909.

West and North Kamtchatka: Utka Protopopof 1908; Pallan (by Busch loc. cit. cited as »Vual-vaai») Savtchenko 1911; Karaginsk Island acc. to Mertens loc. cit., do. Loginovski 1910, do. Skobunof 1920.

»Kamtchatka»: Steller acc. to Pallas loc. cit.; Lubarsky, Kusmischeff, Erman acc. to Busch loc. cit. (probably the report in Erman, Verzeichn. p. 54 was taken to concern Kamtchatka), Peters.

Noted in the following associations:

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 158, A. 160); Sparse (A. 90 b); Scattered (A. 213); Abundant (A. 70 a, A. 94, A. 102); Profuse (A. 78 c, A. 82).

In *Vaccinium—Diapensia*—Lichen ass.:
Sparse (A. 164); Scattered (A. 166); Abundant (A. 168).

In *Carex—Rubus chamaemorus—Vaccinium—Empetrum* ass.:
Single (A. 58, A. 59 a).

In South Kamtchatka this plant is common on the heaths of the alpine and high-alpine regions. It flowers in the beginning of June.

The material enumerated above is not uniform. The specimens from the northern part of our area belong to the form of the plant that is common in Scandinavia and in arctic countries, and which may be said to be the head-form of the species. Specimens from the Kuriles, southern and eastern Kamtchatka and Commander Islands, however, differ slightly from that type. They have larger, broader, more spathulate and obtuse leaves, deeper and more closely reticulated on the upper side and more lax branches. This type was described by Nakai in Bot. Mag. Tokyo 35 (1921) p. 134 as *Arctous japonica*. Nakai writes »Ab *Arctous alpina* quae affinis ramis laxius dispositis, foliis 2—4 plo majoribus, floribus dilute ochroleucis v. viridescentibus urceolatis nec ovatis non oblongis ovatis distinguenda». From the small material available I could not establish any distinct difference in the form and colour of the corolla, which varies considerably within the head-form. The habitus of the plant and its leaves are, however, so different that it seems evident that they must be regarded as belonging to a separate race (compare Pl. 4 fig. b) for which I propose the name var. *japonica* (Nakai) nov. comb. The conditions are thus similar to those in several other *Ericaceae* in our area, such as *Rhododendron kamtschaticum, Ledum palustre, Vaccinium uliginosum, Vaccinium vitis idaea* all of which have geographically separated races with only few and somewhat indistinct characteristics distinguishing those races from the head-form.

A. alpina var. *japonica* is a Northern Pacific plant. I have seen it from Japan, the Kuriles, Southern and Eastern Kamtchatka and Unalashka. Two

plants from America, which acc. to the descriptions may approach var. *japonica*, but which have red berries, were recently described, the first as *Arctostaphylos rubra* by FERNALD in Rhodora (1914) p. 32 and the second as *Arctous erythrocarpa* SMALL in N. Amer. Fl. 29: 1 (1914) p. 102. FERNALD reports his species as occurring also in Siberia and Western China. (*Arctous alpina* var. *rubra* REHD. & WILSON = *Arctous rubra* NAKAI Trees and shrubs indigenous in Japan prop. I 1922 p. 156 fig. 90) while SMALL cites it only from Western America. The fruits of all the specimens that I saw in Kamtchatka were black when ripe. The *Arctostaphylos* forms of this type from Eastern Asia and Western America seem to need revision. In Rhodora 16 (1914) p. 25—32 FERNALD discusses the reasons for separating our plant from the genus *Arctostaphylos* and comes to the conclusion that there are hardly any reasons for such differentiation.

Type of distribution: The head-form: Circumpolar, arctic-alpine. Var. *japonica:* Northern Pacific.

Geographical area: Europe: From northernmost Scandinavia and Nova Zembla southwards to Scotland, southern Norway and northern Russia, in the Urals southwards to central Perm. Also in Jutland, the Pyrenees, Jura, the Alps, the Apennines, the Illyrian mts., and the Carpathians. (Often reported from Iceland but not recorded by GRÖNLUND in »Islands flora», nor by any later author as far as I know. STRÖMFELT in Kungl. Sv. Vet. Akad. Övers. 41, 1884 No. 8 expressly says that it is not found in Iceland.) Asia: from the North Coast southwards in the mts. to Altai and Sajan mts., Transbaikalia, Corea and Honshu. America: from the north coast of Alaska to North Devon, Baffin Land, Labrador and Newfoundland southwards to Alaska (54° N. lat.) and New Hampshire (44° N. lat.), N. Greenland some few localities between 65° N. lat. and 74° N. lat. E. Greenland in the Scoresby-Sound region. Var. *japonica* known from Japan, the Kuriles, Kamtchatka and Unalashka.

Arctostaphylos Uva ursi (L.) SPRENG.

LEDEB., Fl. Ross. II p. 909; HERDER, Pl. Radd. Monopet. No. 30 in Acta Horti Petrop. I: 2 (1872) p. 325 et RADDE, Reisen IV: 1 p. 43; KUZNETS. in Fl. As. Ross. 9 (1916) p. 58; cfr. E. BUSCH in Fl. Sibir. Orient. extrem. III p. 88. — *Arbutus Uva ursi* L., PALLAS, Fl. Ross. I: 2 p. 48; PENNANT, Arct. Zool. (1874) p. CXV; GEORGI, Beschreib. III: 4 p. 959; LANGSDORFF, Bemerk. p. 229. — »*Uva ursi*» STELLER in PALLAS, Neue Nord. Beytr. II (1781) p. 300.

STELLER loc. cit. reports »*Uva ursi*» from Bering Island. He thereby probably meant *Arctostaphylos alpina*. His report was repeated by LEDEBOUR. LANGSDORFF probably made the same mistake. PALLAS only mentions the Kamtchadal name of the plant »Katakynun». HERDER reports MERK as having collected the species in Kamtchatka and KUZNETSOF gives Kamtchatka peninsula and Bering Island as localities for the plant without giving the sources of his report. No reliable report of *Arctostaphylos Uva ursi* from Kamtchatka exists and the plant should be excluded from the flora of our area. It is known from Jakutsk prov. and Saghalin.

Vaccinium Myrtillus L.

PENNANT, Arct. Zool. (1784) p. CXV; CHAMISSO in Linnaea I (1826) p. 525; LEDEB., Fl. Ross. II p. 902; cfr. HERDER, Pl. Radd. Monopet. No. 19 in Acta Horti Petrop. I: 2 (1872) p. 314 et RADDE, Reisen IV: 1 p. 32; KUZNETS., Fl. As. Ross. 9 (1916) p. 67. — »*Vaccinium pedunculis unifloris, foliis serratis*» GMEL., Fl. Sib. III p. 136.

Most of the above reports of *V. Myrtillus* from Kamtchatka were evidently based on GMELIN's record. LEDEBOUR also reports the plant from Bering Island acc. to STELLER. The last report may have been caused by *V. ovalifolium*. It is astonishing that the apparently erroneous reports of this plant from Kamtchatka are still repeated in recent works, such as KUZNETSOF loc. cit., where he also includes America in its geographical area! Long ago HERDER and several other authors realized that the plant does not occur in easternmost Asia nor in America. It goes eastwards to about Lake Baikal.

619. ***Vaccinium ovalifolium*** SMITH in REES', Cycloped. 36 (1817) No. 2.

KUZNETS. in Fl. As. Ross. 9 (1916) p. 73; E. BUSCH in Fl. Sib. Orient. Extrem. III (1919) p. 115; KUDO, Fl. Paramush. p. 147. — *Vaccinium Chamissonis* FEDTSCH., Fl. Îl. Comm. p. 82.

Northern Kuriles: Paramushir N. HASHIMOTO 1908 acc. to KUDO loc. cit.

Commander Islands: Bering Island STELLER, STEJNEGER and DYBOVSKY all acc. to FEDTSCH. loc. cit.; Copper Island STEJNEGER and MOROZEVICZ both acc. to FEDTSCH. loc. cit.

The few Asiatic specimens referred to this species which I have seen are not quite identical with the American plant. The material was, however, too small to allow of a definite opinion as to the identity of the American and the Asiatic plant, and as I have not seen either the plant from Commander Island or that from Paramushir, my report of *V. ovalifolium* from our area is only a quotation from earlier authors. It may be noted that HASHIMOTO is quoted as having collected on Paramushir several plants that have not been found there by any other collector and that the occurrence of the plant on that island therefore needs confirmation.

Type of distribution: American, transgressing into E. Asia.

Geographical area: Asia: from (?) the northern Kuriles, Saghalin and Primorsk prov. southwards to Sikoku and Kiushiu, also on Commander Islands. America: from the Aleutian Islands and southern Alaska to Oregon and from Labrador and Newfoundland to Gaspé Penins., also about Lake Superior. A map of the American distribution is given by FERNALD in Mem. Gray Herb. II (1925) p. 253.

620. ***Vaccinium praestans*** LAMB. in Transact. Linn. Soc. 10 (1811) p. 264 tab. IX.

DC., Prodr. VII p. 574; LEDEB., Fl. Ross. II p. 904; HERDER, Pl. Radd. Monopet. No. 24 in Acta Horti Petrop. I: 2 (1872) p. 318 et RADDE, Reisen IV: 1

p. 36; MAXIM. in Mél. Biol. XII (1886) p. 489; MIYABE, Fl. Kuril. p. 246; KUZNETS. in Fl. As. Ross. 9 (1916) p. 74; E. BUSCH, Fl. Sibir. Orient. extrem. III (1919) p. 123.

South Kamtchatka: Poperochnaja R. (Korjaka valley) KOMAROV 1908.

Central Kamtchatka: The Natchika Pass KOMAROV 1908 (Hb. Berol.); »Malka» R. »between Malka and Avatcha» Hb. PALLAS acc. to HERDER loc. cit. (probably collected by STELLER); the Malka Mts. RIEDER 1831 acc. to HERDER and KUZNETS. loc. cit.; 1 km. S. of Malka on the hill »Shikshitch» July 22nd 1924 P. T. NOVOGRABLENOF.

»Kamtchatka»: »Western Coast J. SMALL» acc. to MIYABE loc. cit.

This species apparently occurs within a small isolated area about the villages of Malka and Natchika.

Type of distribution: Asiatic Pacific.

Geographical area: Isolated area in Kamtchatka; the southern Kuriles Saghalin and the adjacent coast of the mainland, Yezo and Honshu.

621. ***Vaccinium uliginosum*** L., Sp. pl. ed. I (1753) p. 350.

KRASCHENINN., Kamtsch. p. 101 (not seen); PENNANT, Arct. Zool. (1784) p. CXV; PALLAS, Fl. Ross. II p. 45; LANGSDORFF, Bemerk. p. 299; MERTENS, Bemerk. Fl. Koragins. p. 62; ERMAN, Verzeichn. p. 59; HOOK. & ARNOTT in Beechy's Voy. p. 116; LEDEB., Fl. Ross. II p. 904; KITTLITZ, Denkw. II p. 321; HERDER, Pl. Radd. Monopet. No. 25 in Acta Horti Petrop. I: 2 (1872) p. 319 et RADDE, Reisen IV: 1 p. 37 (α *genuinum*, β *Krushianum*); YABE & YENDO, Fl. Shimushu p. (191); FEDTSCH., Fl. Îl. Comm. p. 82 (also var. *Krushianum*); KOM., Voy. Kamtch. p. 452 et Fl. Penins. Kamtsch. pp. 36, 333; KUZNETS. in Fl. As. Ross. 9 (1916) p. 70; E. BUSCH in Fl. Sib. Orient. extrem. III p. 106 (var. *genuinum*, var. *alpinum*, var. *vulcanorum*); KUDO, Fl. Paramush. p. 146. — »*Vaccinium pedunculis unifloris, foliis integerrimis . . .*» GMEL., Fl. Sib. III p. 137. — »*Trunkelbeeren*» STELLER in PALLAS, Neue Nord. Beytr. II (1781) p. 300. — »*Blaubeeren*» DITMAR, Reisen I pp. 437, 574. — *Vaccinium myrtillus* DITMAR, Reisen II pp. 94, 102. — *Vaccinium vulcanorum* KOM. in FEDDE, Rep. Spec. nov. XIII (1914) p. 236; KUZNETS. in Fl. As. Ross. 9 (1916) p. 72.

Northern Kuriles: Paramushir S. YOKOYAMA 1893, T. SAKURAI 1910, KUDO 1920 all acc. to KUDO loc. cit.; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Ozernaja BEZAIS 1909; N. of Ozernaja village in heath noted by HN; N. of Illina volcano noted in A. 207; N.E. of Javina noted in A. 95; between Javina and Kochegochek noted in A. 94; between the arms of Kochegochek rivers noted in A. 90 b; W. of Sholtovskaja volcano noted in A. 205; Sholtovskaja volcano 500 m. Aug. 23rd 1922 HN No. 4364; Kochegochek noted in A. 213; between the mouths of Kochegochek and Golygina rivers noted in A. 102; S. of Golygina village in heath noted by HN; Golygina village noted by HN; between the mouths of Golygina and Opala rivers in heath noted by HN; N. of Opala village noted in A. 214; middle Shadutka R. growing in groups in »the volcanic desert» noted by HN; N. of Shadutka volcano noted in A. 80, A. 82; Shadutka volcano 1260 m. noted by

Hn; the divide between Shadutka and Savan rivers noted by Hn; the Savan mts. noted in A. 78 c; middle Opala R. Rubinski 1908; Lake Kambolnoje noted in A. 218; the mouth of Artemjeva R. noted in A. 220; Akhomten Bay Sept. 10th 1920 Hn No. 1251, do. 800 m. Sept. 18th 1920 Hn No. 1409; Gorelaja volcano noted in A. 162, A. 166, A. 167, A. 168, A. 169, A. 170, A. 172, A. 173; Opala volcano 620 m. July 21st 1921 Hn No. 2346 (A. 70 a), do. 1160 m. noted by Hn; between Opala and Lake Tolmachovaja noted in A. 158; Lake Tolmachovaja noted in A. 159, A 160; lower Tolmachovaja R. noted in A. 156; near the mouth of Bolshaja R. July 5th 1921 Hn No. 1939, do. noted in A. 45, A. 46, A. 49, A. 51; N.E. of the mouth of Bolshaja R. noted in A. 104; lower Bolshaja R. noted in A. 108, A. 109 a; lower Karymchina R. noted by Hn; near the mouth of Ipelka R. noted in A. 58, A. 59 a, A. 59 b; S. of Bolsheredsk in bog noted by Hn; Bolsheredsk Bezais 1909; Apatcha in bog noted by Hn; Siku R. noted by Hn; Glinini mts. Rubinski 1908; mt. »Babi Kamen», Paratunka, Komarov 1908; mt. »Zaikin mys», Paratunka Komarov 1908; Mikisha Komarov 1908; mt. Trubi Komarov 1908; Shalsan R. Komarov 1908; mt. Tshapotchka Komarov 1908 (Hb. Berol.); mt. Zerkalo, Natchika, noted in A. 117; mt. Palovinaja 900 m. July 8th 1920 Hn No. 317; Savoiko Komarov 1909; do. June 28th 1928 W. Eyerdam; »Avatcha Bay» acc. to Hook. & Arnott loc. cit.

East Kamtchatka: The Kalashtyrka valley Komarov 1909, do. Perfiljef 1910 (Hb. Berol.); between Petropavlovsk and Avatcha volcano 350 m. Aug. 22nd 1920 Hn No. 1024 (A. 16); Avatcha volcano mt. Saraj »Komarov» (should probably be Perfiljef) (Hb. Berol.), do. 900 m. July 30th 1920 Hn No. 628 (f. *vulcanorum*); Kichpinitch volcano Komarov 1909; mt. Kraschenin-nikof Komarov 1909 (sub *V. vulcanorum*); Lake Kronoki Komarov 1909 (cited by Kuznets. loc. cit. as »Lake Kuznetskavo» (sub *V. vulcanorum*), do. Sept. 4th 1921 Hn No. 3566 (Malaise), do. 900 m. Sept. 12th 1921 Hn No. 3593; Klutchevskaja volcano Bezais 1908.

Commander Islands: Bering Island Steller, Dybovsky, Grebnitsky, Morozevicz all acc. to Fedtsch. loc. cit., Gudzenko 1910.

Central Kamtchatka: Korjatskaja volcano Aug. 14th 1928 W. Eyerdam (also f. *vulcanorum*); mt. Zerkalo, Malka Protopopof 1908; Ganala Komarov 1909, do. Grinop. 1909; Kamtchatka vershina acc. to Kom. loc. cit., between Sharomsk and Vershne Kamtchatsk Protopopof 1908; Shtchapina acc. to Kom. loc. cit.; Tobatchik acc. to Kom. loc. cit.; Kosyrevsk Protopopof 1909; The Ushki »tundra» Protopopof 1909.

West and North Kamtchatka: Kishtchik Rubinski 1909; Chairusovaja Novikof 1909; between Sedanka and Jelovka Aug. 20th 1927 Vavilin; Tigil Levitzky, do. acc. to Erman loc. cit., do. Gudzenko 1910; Ettolachan acc. to Ditmar loc. cit. p. 574; Karaginsk Island Postels acc. to Herder loc. cit., do. acc. to Mertens loc. cit.

»Kamtchatka»: Lubarsky, Kastalsky, »Petropavlovsk Mertens», Kittlitz, Peters, Rieder.

Noted in the following associations:

In *Vaccinium—Empetrum*—Moss ass.:
Single (A. 218); Sparse (A. 214); Scattered (A. 95, A. 104, A. 108); Abundant (A. 16, A. 156); Profuse (A. 172).

In *Artemisia arctica—Solidago—Salix* »*arctica*» ass.:
Single (A. 80); Sparse (A. 205).

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 82, A. 90 b, A. 94, A. 159); Sparse (A. 70 a, A. 78 c, A. 102); Scattered (A. 158, A. 213); Abundant (A. 160, A. 207).

In *Vaccinium—Empetrum—Rhododendron chrysanthum* ass.:
Single (A. 117); Sparse (A. 162, A. 167); Scattered (A. 169); Abundant (A. 173).

In *Vaccinium—Diapensia*—Lichen ass.:
Sparse (A. 166, A. 168, A. 170); Scattered (A. 164).

In *Carex—Rubus chamaemorus—Vaccinium—Empetrum* ass.:
Sparse (A. 45, A. 59 a, A. 59 b); Scattered (A. 46, A. 51, A. 58, A. 109 a, A. 220); Abundant (A. 49).

In South Kamtchatka *V. uliginosum* is common in all heaths in the lowlands as well as in the alpine region. It also occurs in the *Rhododendron chrysanthum* association (and in borders around *Pinus pumila* thickets formed by fragments of that association) and in the *Rubus chamaemorus*-bogs. It flowers in July. Acc. to KITTLITZ its old kamtchadal name was »dyngoltch».

V. uliginosum is a very variable plant, which in Scandinavia occurs in a multitude of forms. The size and habitus of the whole plant vary greatly. The leaves are usually obovate or elliptical, somewhat emarginated, but forms with practically circular leaves as also with narrowly lanceolate leaves occur. The form and size of the flowers and fruits vary considerably. The peduncles vary from less than a millimetre to about 13 mm. in length. The length and direction of the horns of the anthers are also subject to considerable variation. An account of some of these variations is given by LINDMAN in Bot. Not. 1892, p. 145—154.

Under such circumstances it is of little value to divide the material into different forms. It may be stated, however, that the Kamtchatka plant can hardly be referred to var. *alpinum* BIGEL, Fl. Bost. ed. 2 (1824) p. 153 (non BUSCH) (= subsp. *microphyllum* LANGE) which seems to be a comparatively distinct, small-leaved type, in the first place met with in Greenland but also in arctic America and in Asia, although alpine specimens (for instance HN No. 4364) approach this type (Comp. FERNALD in Rhodora 25, 1913, p. 23). Lowland specimens (for instance HN No. 1024) can hardly be distinguished from certain lowland forms in Scandinavia.

The Eastern Asiatic alpine type of *V. uliginosum* is often referred to var. or f. *Krushianum* FISCH. I have seen the type specimen of »*V. Krushianum* FISCHER» and it seems to be the common procumbent alpine form of *V. uliginosum* with obovate leaves.

Kamtchatka specimens of our plant have hairy year-shoots and thus do not belong to subsp. *imberbe* PRINTZ, Veg. Sib. Mong. front. p. 343.

KOMAROV recently described a peculiar type from Kamtchatka under the name *V. vulcanorum*, characterized acc. to him by procumbent stems, subimbricate round leaves green on the underside, and smaller berries. In my opinion it is merely a form of *V. uliginosum*. The plants have been covered by volcanic ashes, which very often flow down the cones of the volcanoes like a thick pap. The leaves covered by the ashes have died and in the top of the branches crowded new leaves have developed. It is possible to distinguish several »storeys» on some of the specimens, which have apparently been covered two or three times with ashes. Sometimes also leaves of other plants can be found between the branches under the present surface. No difference in the size of the berries or colour of the leaves could be found, and specimens that I myself collected on the Avatcha volcano (HN No. 628) have not the extremely rounded leaf-form of the type-specimen of *V. vulcanorum*. Similar forms, apparently caused by moving soil, are often met with in the Greenland plant, and I have seen such forms also from other arctic places where movements of the soil are common.

Type of distribution: Circumpolar.

Geographical area: Europe from Iceland, Spitzbergen (one locality known: Kol Bay) and Nova Zembla, southwards to Spain, Italy, the Balkans, northern Kiew, Kasan and Orenburg, also in W. Caucasus (to the south in the mts.). Asia: from the mouths of the Yenisei and Lena rivers and from Chukch Penins., southwards to southern Tobolsk prov., northern Mongolia, Corea and Honshu. America: from the north coast of Alaska to Ellesmereland and Newfoundland, southwards to British Columbia (50° N. lat.), Michigan and the mts. of New Hampshire (44° N. lat.). W. and E. Greenland to about 78° N. lat. In Greenland, arctic America and Asia var. *alpinum* BIGEL.

622. ***Vaccinium vitis idaea*** L., Sp. pl. ed. I (1753) p. 351.

KRASCHENINN., Kamtsch. p. 101 (not seen); PENNANT, Arct. Zool. (1784) p. CXV; PALLAS, Fl. Ross. 1: 2 p. 46; GEORGI, Beschreib. III: 4 p. 931; LANGSDORFF, Bemerk. p. 229; CHAMISSO & SCHLECHT. in Linnaea I (1826) p. 526; MERTENS, Bemerk. Fl. Koragins p. 62; HOOK. & ARNOTT in Beechy's Voy. p. 116; LEDEB., Fl. Ross. II p. 901; KITTLITZ, Denkw. II pp. 350, 377; HERDER, Pl. Radd. Monopet. No. 18 in Acta Horti Petrop. I: 2 (1872) p. 312 et RADDE, Reisen IV: 1 p. 30 (α *genuinum*, β *microphyllum*); MIYABE, Fl. Kuril. p. 247; DITMAR, Reisen I pp. 574, 768, do. II pp. 94, 102; YABE & YENDO, Fl. Shimushu p. (190); FEDTSCH., Fl. Îl. Comm. p. 80 (var. *microphyllum*); KOM., Voy. Kamtch. p. 452 et Fl. Penins. Kamtsch. I p. 333; KUZNETS. in Fl. As. Ross. 9 (1916) p. 75; E. BUSCH in Fl. Sib. Orient. extrem. III p. 126; KUDO, Fl. Paramush. p. 146. — »*Vaccinium racemis terminalibus nutantibus . . .*» GMEL., Fl. Sib. III p. 138. — »*Preisselbeeren*» STELLER in PALLAS, Neue Nord. Beytr. II (1781) p. 300.

Northern Kuriles: Paramushir S. YOKOYAMA 1893, M. AIZAWA 1900, KUDO 1920 all acc. to KUDO loc. cit.; Shumshu acc. to MIYABE and YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka June 17th 1920 Hn No. 51; Illina volcano 650 m. noted by Hn; N. of Illina volcano noted in A. 207; N.E. of Javina noted in A. 95; between the branches of Kochegochek R. noted in A. 90 b; between Javina and Kochegochek noted in A. 94; S. of Kochegochek noted by Hn; Kochegochek noted in A. 213; between Kochegochek and Golygina R. noted in A. 102; Golygina village noted by Hn; between the mouths of Golygina and Opala rivers noted by Hn; N. of Opala village noted in A. 214; Shadutka volcano 1260 m. Aug. 2nd 1921 Hn No. 2588; near Shadutka noted in A. 82; the Savan mts. noted in A. 78 c; between Opala and Bolshaja rivers Rubinski 1909; S.W. slope of Assatcha mts. noted in A. 186; lake Kambolnoje noted in A. 218; the mouth of Artemjeva R. noted in A. 220; Akhomten Bay 900 m. Sept. 18th 1920 Hn No. 1398, do. noted in A. 33; Gorelaja volcano 800 m. July 22nd 1922 Hn No. 3978 (A. 162, A. 163, A. 164, A. 166, A. 167, A. 168, A. 169, A. 170, A. 172, A. 173); Opala volcano 620 m. July 21st 1921 Hn No. 2268 a (A. 70 a), do. 1160 m. noted by Hn; Lake Tolmachovaja noted in A. 159, A. 160; lower Tolmachovaja R. noted in A. 156; N.E. of the mouth of Bolshaja R. noted in A. 104; near the mouth of Bolshaja R. July 3rd 1921 Hn No. 1931, do. July 5th 1921 Hn No. 1968 (A. 45, A. 46, A. 49, A. 51); lower Bolshaja R. noted in A. 108, A. 109 a; near the mouth of Ipelka R. noted in A. 58, A. 59 a, A. 59 b; Bolsheredsk Rubinski 1908; Apatcha noted by Hn; mt. »Babi kamen», Paratunka Komarov 1908; mt. »Zaikin mys», Paratunka Komarov 1908; Glinini mts. Rubinski 1908; mt. Stoll noted in A. 121; Tarja Bay Gudzenko 1910; mt. Tschapotchka, Natchika, Komarov 1908; mt. Zerkalo, Natchika, noted in A. 117; Hutor July 1st 1928 W. Eyerdam; Savoiko Komarov 1908, do. June 27th 1928 Malaise; »Avatcha Bay» acc. to Hook. & Arnott loc. cit.

East Kamtchatka: Petropavlovsk acc. to Cham. & Schlecht. loc. cit.; between Petropavlovsk and Avatcha volcano 350 m. Aug. 22nd 1920 Hn No. 1034, do. noted in A. 16; Nalutcheva Perfiljef 1910; Semjatchik acc. to Ditmar loc. cit. p. 760; Lake Kronoki Sept. 4th 1921 Hn No. 3568 (Malaise), do. Sept. 12th 1921 Hn No. 3596 a (Malaise); Ustj Kamtchatsk July 15th 1925 Malaise No. 508, do. Aug. 18th 1926 Malaise No. 404; the Chartchina mts. Aug. 12th 1927 Malaise.

Commander Islands: Bering Island Stellee acc. to Pallas loc. cit., Kjellman, Grebnitzky and acc. to Fedtsch. loc. cit. Dybovsky and Dobrotvorsky; Copper Island Grebnitzky acc. to Fedtsch. loc. cit.

Central Kamtchatka: Mt. Zerkalo, Malka, Protopopof 1908; the foot of Korjatskaja volcano Komarov 1908; mt. Aak Komarov 1908; Ganala Kittlitz; between Ganala and Pushtchina Grinop 1908; Kamtchatka vershina acc. to Kom. loc. cit.; between Kirganik and Mashura acc. to Kom. loc. cit.; Anauna R. Sept. 5th 1926 Malaise No. 405; Shtchapina Komarov 1909 (the head-form), do. July 23rd 1921 Hn No. 3479 (Malaise) (the head-form); between Shtchapina and Tolbatchik Bezais 1908 (the head-form); Svetloj klutch R.

May 22nd 1925 MALAISE; Kosyrevsk GRINOP 1909 (the head-form), do. July 9th 1921 Hn No. 3426 (MALAISE) (the head-form).

West and North Kamtchatka: Kishtchik RUBINSKI 1908; Tigil GUDZENKO 1910; Ettolachan acc. to DITMAR loc. cit. p. 574; Pallan SAVTCHENKO 1911; Karaginsk Island MERTENS, do. POSTELS, do. LOGINOVSKI 1910.

»Kamtchatka»: ESCHSCHOLTZ, LUBARSKY (the head-form), STEWART (the head-form), KASTALSKY, KUSMISCHEFF, »Petropavlovsk MERTENS», RIEDER.

Noted in the following associations:

In *Vaccinium—Empetrum*—Moss. ass.:
Single (A. 16, A. 95, A. 156, A. 214); Sparse (A. 108); Scattered (A. 104, A. 218); Abundant (A. 172).

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 70 a, A. 82, A. 90 b, A. 94, A. 158, A. 159, A. 160, A. 207, A. 213); Sparse (A. 78 c, A. 102).

In *Vaccinium—Empetrum—Rhododendron chrysanthum* ass.:
Single (A. 117, A. 162, A. 173); Sparse (A. 167, A. 169).

In *Vaccinium—Diapensia*—Lichen ass.:
Single (A. 164, A. 166, A. 168, A. 170).

Carex—Rubus chamaemorus—Vaccinium—Empetrum ass.:
Single (A. 45, A. 46, A. 49, A. 51, A. 58, A. 59 a, A. 59 b, A. 109 a); Scattered (A. 220).

In *Pinus pumila—Spiraea—Sphagnum* ass.:
Single (A. 121); Sparse (A. 186).

In *Pinus pumila—Rhododendron*—Moss ass.:
Single (A. 33, A. 163).

In South Kamtchatka this plant is common in all heaths in the lowlands as well as in the alpine region. It also occurs in the *Rhododendron chrysanthum* association, in the *Pinus pumila* thickets and in the *Rubus chamaemorus*-bogs. In all heaths and bogs it follows *V. uliginosum* but is always less abundant than that species.

It flowers in June and July. The berries of No. 1398 were ripe and smaller, though considerably sweeter, than those of the Swedish plant.

Most of the specimens belong to var. *minus* LODD., which might better be regarded as a subspecies, as it has a large geographical area of its own. All American and Greenland specimens as well as most of the Eastern Asiatic and arctic Eurasiatic ones belong to that type. No good characteristic distinguishing it from the head-form — which is a plant inhabiting the Eurasiatic wooded belt — can be given; nevertheless, its small growth and characteristic habitus is so different from that of the head-form that there can hardly be any doubt that it should be regarded as a separate race. In the wooded country in central Kamtchatka the head-form also occurs, being at once recognizable on account of its high growth and about 10-flowered racemes. (Var. *minus* has only 1—4-flowered racemes.)

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland (rare), northernmost Scandinavia and Nova Zembla southwards to the Pyrenees, northern Italy, the northern Balkans, Kiew, Tambow and Orenburg, also in Caucasus. Asia: from the North Coast and the New Siberian Islands southwards to northern Mongolia, Corea and Honshu. America: from the north coast of Alaska to Baffin Land, Labrador and Newfoundland southwards to Alaska (56° N. lat.), the Great Lakes and Massachusetts (43° N. lat.). W. Greenland from about Disco southwards to about 64° N. lat. (Some few localities north of Disco, not known from E. Greenland.) The Greenland plant, the entire American plant, as well as specimens from Eastern Asia and from the north coast of the Eurasiatic continent westwards to Nova Zembla and Kolgujef, belong to var. *minus*.

623. ***Oxycoccus microcarpus*** Turcz. ex Rupr. in Beitr. z. Pflanzenk. des Russ. Reich. IV (1845) p. 56.

E. Busch in Fl. Sib. Orient. extr. III p. 102.

South Kamtchatka: Middle Opala R. noted by Hn; the mouth of Artemjeva R. noted in A. 220; upper Abshen R. noted by Hn; near the mouth of Bolshaja R. July 5th 1921 Hn No. 1938 (A. 45, A. 49, A. 50, A. 51); lower Bolshaja R. noted in A. 109 a, A. 110; near the mouth of Ipelka R. noted in A. 59 a, A. 59 b; S. of Bolsheredsk noted by Hn; between Paratunka village and Mikisha Komarov 1908; Shalsan R. Komarov 1908; »Pilnaja tundra» Savoiko Komarov 1908.

West and North Kamtchatka: Kichtchik Rubinski 1908.

Noted in the following associations:

In *Carex—Rubus chamaemorus—Vuccinium—Empetrum* ass.:
Single (A. 45, A. 49, A. 51, A. 59 a, A. 59 b, A. 109 a).

In *Carex—Sphagnum* ass.:
Single (A. 50).

In *Carex—Myrica* ass.:
Single (A. 110).

O. microcarpus is not rare in the *Sphagnum*-bogs of South Kamtchatka. It is often united with *O. quadripetalus* into one species under the name *O. palustris*. From *O. quadripetalus* it differs in smaller growth, leaves broadest at the base, glabrous or only slightly hairy pedicels with bracts at or below the middle and in filaments hairy on their outer surface. Hybrids between the two species occur. In Scandinavia *O. microcarpus* is a more northern species than *O. quadripetalus*. In northernmost Sweden, especially in the alpine parts, it is the only *Oxycoccus* species, and the same applies to the north coast of the Kola penins., where I sought in vain for *O. quadripetalus* during a journey there in 1927. Other northern specimens, for instance that of Kjellman from Port Clarence in Alaska, also belong to *O. microcarpus*.

Type of distribution: ?Circumpolar.

Geographical area: Europe: from Iceland, northernmost Scandinavia and the north coast of Kola Penins. southwards to Central Europe. Asia: from lower Obi, Yenisei and Kolyma rivers southwards to southern Siberia, Amur prov. and Saghalin. America: I have seen specimens from Alaska (Port Clarence, Yukon, Sitcha) and »Labrador».

624 ***Oxycoccus quadripetalus*** Gilib., Fl. Lithuan. I (1872) p. 5.

Fedtsch., Fl. Îl. Comm. p. 83. — »*Vaccinium foliis integerrimis revolutis ovatis caulibus repentibus . . .*» Gmel., Fl. Sib. III p. 140. — *Vaccinium oxycoccus* Krasch., Kamtsch. p. 101 (not seen); Pennant, Arct. Zool. (1784) p. CXV; Pallas, Fl. Ross. I: 2 p. 47; Georgi, Beschreib. III: 4 p. 953; Langsdorff, Bemerk. p. 229; Mertens, Bemerk. Fl. Koragins p. 62; Ditmar, Reisen II p. 102; Kuznets. in Fl. As. Ross. 9 (1916) p. 64; E. Busch in Fl. Sib. Orient. extr. III p. 99; Kittlitz, Denkw. I p. 343, II p. 321. — *Oxycoccus palustris* Ledeb., Fl. Ross. II p. 905; Herder, Pl. Radd. Monopet. No. 26 in Acta Horti Petrop. I: 2 (1872) p. 321 et Radde, Reisen IV: 1 p. 39; Kom., Voy. Kamtch. p. 453; Kudo, Fl. Paramush. p. 145. — »?*Vaccinium oxycoccoides* L.» Yabe & Yendo, Fl. Shimushu p. (190).

Northern Kuriles: Paramushir acc. to Kudo loc. cit.; ?Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Lower Ozernaja R. Aug. 12th 1921 Hn No. 2842; Golygina R. 60 verst from the mouth Rubinski 1909; middle Ksudach R. noted in A. 87; E. of Zykovaja village noted in A. 103; near the mouth of Bolshaja R. Rubinski 1908, do. July 5th 1921 Hn No. 1940 (A. 47, A. 52); Nikolajevsk Komarov 1908 (Hb. Berol.); Tarja Bay Komarov 1908, do. July 27th 1920 Hn No. 558 (Malaise); Bogatyrjovka July 16th 1920 Hn No. 429; Hutor June 29th 1928 W. Eyerdam; Savoiko July 1st 1928 W. Eyerdam.

East Kamtchatka: Between Petropavlovsk and Avatcha volcano noted in A. 21; Haliger acc. to Kom. loc. cit.

Commander Islands: Bering Island Dybovsky and Stejneger acc. to Fedtsch. loc. cit.; Copper Island Stejneger acc. to Fedtsch. loc. cit.

Central Kamtchatka: Malka Protopopof 1908; Mashura Komarov 1909.

West and North Kamtchatka: Kichtchik Rubinski 1908; Tigil Levitzky 1848; Karaginsk Island acc. to Mertens loc. cit.

»Kamtchatka»: Krascheninnikof acc. to Ledeb. loc. cit., Kastalsky, Kusmischeff acc. to Herder loc. cit., »Petropavlovsk Mertens», Peters, Rieder.

Noted in the following associations:

In *Carex—Sphagnum* ass.:
Single (A. 47, A. 52); Sparse (A. 103).

In *Carex—Myrica* ass.:
Single (A. 21).

In *Carex—Sanguisorba*—Moss ass.:
Single (A. 87).

In South Kamtchatka this plant occurs here and there, chiefly in the *Sphagnum*-bogs.

Type of distribution: Circumpolar.

Geographical area: As *O. quadripetalus* was often united with *O. microcarpus*, it is difficult to give the areas of the two plants separately. Europe: from about the Arctic Circle in Scandinavia and Russia, southwards to central France, northern Italy and central Russia (not known from Iceland). Asia: at Obi and Yenisei from about the Arctic Circle, from Verchojansk distr. (acc. to Kom. 1926) and northern Kamtchatka, southwards to southern Yeniseisk and Irkutsk provinces, northern Mongolia, Corea and Honshu. America: reported from Alaska to Labrador, southwards to Washington, Michigan and New Jersey. W. Greenland.

Diapensiaceae Lindbl.

625. ***Diapensia lapponica*** L., Sp. pl. ed. I (1753) p. 141.

var. ***obovata*** Fr. Schm., Fl. Sachal. (1868) p. 161.

Diapensia lapponica L., Mertens, Bemerk. Fl. Koragins p. 62; Cham. & Schlecht. in Linnaea VI (1831) p. 553; Erman, Verzeichn. p. 60; Ledeb., Fl. Ross. III p. 85; Herder, Pl. Radd. Monopet. No. 147 in Acta Horti Petrop. I: 2 (1872) p. 487 et Radde, Reisen IV: 1 p. 205; Miyabe, Fl. Kuril. p. 248 (β *asiatica*); Yabe & Yendo, Fl. Shimushu p. (191); Fedtsch., Fl. Îl. Comm. p. 93; Kom., Voy. Kamtsch. pp. 63, 300, 414, 452; Kudo, Fl. Paramush. p. 147 (var. *obovata*); E. Busch in Fl. Sib. Orient. extr. IV p. 2 (var. *obovata*).

Northern Kuriles: Paramushir M. Aizava 1900, Kudo 1920 both acc. to Kudo loc. cit.; Shumshu acc. to Miyabe and Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka Rieder 1831; do. east coast June 16th 1920 Hn No. 16, do. west coast June 22nd 1920 Hn No. 119 b; N.W. of Kurile Lake 1050 m. noted by Hn; Ozernaja R. Bezais 1909; Shadutka volcano 1100 and 1260 m. noted by Hn; Topik 470 m. noted by Hn; Akhomten bay 500 m. Sept. 13th 1920 Hn No. 1377 (A. 33); Mutnovskaja volcano up to 1460 m. noted by Hn; Gorelaja volcano 825 m. noted in A. 164, A. 170, do. 900 m. noted in A. 171, do. 1000 m. noted in A. 166, A. 168; Opala volcano 1040 m. July 21st 1921 Hn No. 2325, do. 1300 m. noted by Hn; upper Tolmachovaja R. noted by Hn; mt. Babi Kamen, Paratunka R., Komarov 1908; mt. Trubi, Vilju R. Komarov 1908; mt. Taburett, Natchika Rubinski 1909; the Shalsan Pass Vossnesensky 1847, do. Komarov 1908; the sources of Uzdets R. Komarov 1908, do. Rubinski 1908; mt. Tschapotka Komarov 1908 (Hb. Berol.); sources of Poperochnaja R. Komarov 1908; mt. Palovinaja, Savoiko July 14th 1928 W. Eyerdam, do. July 22nd 1928 Malaise.

East Kamtchatka: Mt. Krasheninnikof acc. to Kom. loc. cit.; the Kronoki Pass Komarov 1909 (Hb. Berol.); Lake Kronoki 900 m. Sept. 12th 1921

Hn No. 3582 (Malaise); Klutchevskaja volcano Kozlovski 1909; do. 3000 feet Bezais 1909, do. at the foot Kurtashof 1909; Ploskaja volcano »Pervaja na dolu sopotchka» Protopopof 1909.

Commander Islands: Bering Island Grebnitzky acc. to Fedtsch. loc. cit.; Copper Island Dybovsky, Stejneger, Tilman and Morozevicz all acc. to Fedtsch. loc. cit.

Central Kamtchatka: Mt. Zerkalo, Malka Protopopof 1908; the foot of Korjatskaja volcano Komarov 1908; Ganala Stewart, between Sharomsk and Vershne Kamtchatsk Protopopof 1909; mt. Kunchekla Protopopof 1909; Klutchi Afanasejef 1909.

West and North Kamtchatka: Between Jelovka and Sedanka Bezais 1909; west coast of Kamtchatka acc. to Erman loc. cit.; Karaginsk Island Mertens, Postels.

»Kamtchatka»: »Hb. Steller» Merk, Eschscholtz, Kegel, Stewart, Kusmischeff, »Petropavlovsk Mertens», Erman (Hb. Berol.), Peters.

Noted in the following associations:
In *Vaccinium—Diapensia*—Lichen ass.:
Single (A. 164); Sparse (A. 168, A. 170); Scattered (A. 166).
In *Artemisia arctica—Rhododendron kamtschaticum—Salix »arctica»* ass.:
Single (A. 171).
In *Pinus pumila—Rhododendron*—Moss ass:
Single (A. 33).

D. lapponica var. *obovata* is not rare on the heaths of the high alpine region of South Kamtchatka, ascending up to the altitudinal limit of vegetation. It flowers in June and July.

All Kamtchatka specimens belong to var. *obovata*, characterized by broader and shorter leaves, more reticulated on the upper side and with the median vein at the bottom of a deeper furrow. The petioles are narrower than those of the head-form.

Type of distribution: Circumpolar; var. *obovata* Eastern Asiatic—Western American.

Geographical area: Europe: Iceland, the Scandinavian mts., Kola Penins., Kanin Penins., the Urals southwards to Perm prov. (acc. to Korsh. and Diels). Asia: from the Urals to the mouth of Yenisei and from the mouth of Chatanga R. eastwards to Chukch Penins., southwards in the mts. to N. of Lake Baikal, Ussuri, Saghalin and Honshu; also on Quelpart Isl. America: from the north coast of Alaska to Ellesmereland, Baffin Land, Labrador and Newfoundland, southwards to Sitcha and New Hampshire, W. Greenland (to about 75° N. lat.). E. Greenland to Scoresby Sound. In Asia E. of Chatanga R. var. *obovata*, to which also the W. American material belongs (St. Lawrence Island!, Lynn Channel!). A map of the area is given by Diels in Engler, Bot. Jahrb. 50 (1914) Suppl. tab. VII.

Primulaceae Vent.

Primula ajanensis E. Busch in Fl. Sib. Orient. extr. IV (1926) p. 34.

»Kamtchatka»: Rieder 1831, Bogdanowitsch 1898.

As no particular locality is given on the labels, it must be regarded as uncertain whether Kamtchatka Peninsula or Kamtchatka Province is meant, and the reports thus need confirmation. If the species really occurs within our area it might be expected in the northern part of the peninsula, like the other Ochotsk plants.

626. ***Primula cuneifolia*** Ledeb. in Mém. Ac. Imp. Sc. St. Petersb. V (1814) p. 522.

Ledeb., Fl. Ross. III p. 15; Herder, Pl. Radd. Monopet. No. 80 in Acta Horti Petrop. I: 2 (1872) p. 397 et Radde, Reisen IV: 1 p. 115; Miyabe, Fl. Kuril. p. 249; Yabe & Yendo, Fl. Shimushu p. (191); Fedtsch., Fl. Îl. Comm. p. 90; Kom., Voy. Kamtch. pp. 87, 212, 454; Kudo, Fl. Paramush., p. 148; Turkev. in Fl. As. Ross. I (1923) p. 34; E. Busch in Fl. Sibir. Orient. extr. IV (1926) p. 79 (var. *Dubyi*, var. *saxifragifolia*, var. *elongata*). — *Primula minima* Mertens, Bemerk. Fl. Koragins p. 64.

Northern Kuriles: Paramushir, acc. to Miyabe loc. cit., T. Sakurai 1910, T. Matsubara 1915, Kudo 1920 acc. to Kudo loc. cit.; Shumshu Krascheninnikof acc. to Miyabe loc. cit., Yendo acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka Sept. 11th 1847 Vossnesensky (cited by Turkev. loc. cit. as collected by Mertens), do. west coast June 16th 1920 Hn No. 13; W. of Sholtovskaja volcano noted in A. 205; Topik 580 m. July 28th 1921 Hn No. 2473; Akhomten Bay 20 m. Sept. 10th 1920 Hn No. 1237, do. 250 m. Sept. 11th 1920 Hn No. 1213, do. Sept. 22nd 1920 Hn No. 1460; Gorelaja volcano 800 m. July 14th 1922 Hn No. 3954 (A. 170); Opala volcano 620 m. July 21st 1921 Hn No. 2248, do. 1100 m. July 21st 1921 Hn. No. 2282, do. noted in A. 72; Lake Tolmachovaja noted by Hn; middle Tolmachovaja R. 570 m. noted by Hn; the Kohelok Pass noted in A. 125; mt. Babi Kamen, Paratunka Komarov 1908; mt. »Zaikin kamen», Paratunka Komarov 1908; upper (Paratunka-)Bystraja R. noted in A. 128; Paratunka village Komarov 1908; mt. Trubi Komarov 1908 (Hb. Berol.); mt. Stoll between Apatcha and Natchika noted by Hn; Lake Natchika Komarov 1908; Shalsan R. Vossnesensky 1847, do. 460 m. noted by Hn; mt. Tshapotchka, Natchika Komarov 1908; mt. Palovinaja 700 m., Savoiko July 8th 1920 Hn No. 334; do. July 13th and 14th 1928 W. Eyerdam; Topolovaja R. Rubinski 1908.

East Kamtchatka: Cape Kozloff June 23rd 1924 Malaise; »Sewuchi Kamen» June 1924 Malaise; the Kronoki Pass Komarov 1909 (Hb. Holm.); the foot of Klutchevskaja volcano Kurtashof 1909; Lake Assabatch Aug. 15th 1925 Malaise No. 510.

Commander Islands: Bering Island KJELLMAN, DYBOVSKY 1879, GREBNITZKY 1880 and acc. to FEDTSCH. loc. cit. STEJNEGER; Copper Island DYBOVSKY 1879 and acc. to FEDTSCH. loc. cit. GREBNITZKY and MOROZEVICZ.

Central Kamtchatka: Malka PROTOPOPOF; Gremushej R. KOMAROV 1908; the Ganala tundra GRINOP 1909; mt. »Ganalski ostraki» PROTOPOPOF 1908, Ganala STEWART, do. KITTLITZ; between Ganala and Pushtchina GRINOP 1909; the sources of Kashkan R. KOMAROV 1909 (Hb. Berol.); Svetloj Klutch R. at the sources of Kosyrevsk R. May 22nd 1925 MALAISE No. 509; Anauna R. Aug. 19th 1926 MALAISE No. 403.

West and North Kamtchatka: Between Sedanka and Jelovka BEZAIS 1908; Karaginsk Island MERTENS, do. LOGINOVSKI.

»Kamtchatka»: MERK, KEGEL, STEWART, KUSMISCHEFF, »Petropavlovsk MERTENS», PETERS, RIEDER and acc. to TURKEV. loc. cit. PODVOISKI 1912.

Noted in the following associations:
In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Single (A. 125).
In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 128, A. 205).
In *Artemisia arctica—Solidago—Rhododendron kamtschaticum* ass.:
Single (A. 72).
In *Vaccinium—Diapensia*—Lichen ass.:
Single (A. 170).

In South Kamtchatka *P. cuneifolia* is common in meadows of the alpine region, where it reaches high altitudes. It flowers also as early as in May, and flowering specimens were found near melting snow in Akhomten Bay even at the end of September, when other specimens had ripe capsules.

P. cuneifolia is a very variable plant. The length of the petioles and scapes, the form and size of the leaves and the size of the flowers, vary considerably. Thus the plant from Cape Lopatka (HN No. 13) is a low-grown form which has small rounded, often short-petiolated leaves only about 7 mm. in diameter, while the flowers are up to 25 mm. in diameter. The diameter of the basal rosettes is about 2 cm., while that of the umbels reaches $3\frac{1}{2}$ cm. It should be regarded, together with several others, as belonging to »var.» *saxifragifolia* (LEHM.) PAX. The most common form, which may be considered to be typical *P. cuneifolia* (*α typica* MAKINO in Bot. Mag. Tokyo XVI 1902 p. 140 excl. syn. *P. saxifragaefolia* = *α Dubyi* PAX), has more long-petiolated leaves, longer scape and more richly flowered umbels. Lastly, the specimens with still longer petioles and scapes were called var. *elongata* by E. BUSCH. In an early stage of development the scapes and petioles are shorter and grow later. The above varieties should thus be merely regarded as forms. HN. No 3954 is somewhat doubtful, as it has broader and slightly gibbous involucral leaves. It thus approaches to *P. borealis* DUB. which seems to be related to *P. cuneifolia*.

Type of distribution: Northern Pacific.

Geographical area: Asia: from Gishiga and Northern Kamtchatka southwards over Ochotsk, sources of Bureja R., Saghalin (Tym R. PILSUDSKI acc. to TURKEV. loc. cit.), the Kuriles, Yezo and Honshu. America: the Aleutian Islands, Kodiak, eastwards at least as far as Lynn Channel. In Japan the closely related *P. hakusanensis* FRANCH. and *P. heterodonta* FRANCH. which are regarded by MAKINO as well as by TAKEDA (Notes Bot. Gard. Edinb. VIII 1913 p. 90) as varieties of *P. cuneifolia*. E. BUSCH loc. cit. gives a map of the geographical area. To this should be added localities in Honshu, Yezo, Saghalin, the Kuriles and S.E. Alaska. The locality marked on that map N.E. of Lake Baikal seems very improbable. The only source for it in the text seems to be »R. Gonkuli PAVLOVSK.!» (loc. cit. p. 81). I have not been able to find Gonkuli R. on the map, but PAVLOVSKI made journeys from Jakutsk to Utchur R. and Nelkan and further, and has thus touched the area of our species. The locality in question may need confirmation. The dot representing the locality »sources of Bureja R. SCHMIDT» on that map is placed too far to the S.W. Our plant is also reported from Kotzebue Sound by HOOK. & ARNOTT. The habitually very similar *P. borealis* DUB. is known from this locality and the report may be regarded as doubtful until proved otherwise. E. BUSCH loc. cit. cites HOOK. & ARNOTT's report under »var. *saxifragifolia*», but has not marked it on the map.

627. ***Primula eximia*** GREENE in Pittonia III (1897) p. 251.

YABE & YENDO, Fl. Shimushu p. (191); TAKEDA in Notes Bot. Gard. Edinb. VIII (1913) p. 90 pl. XXII; KUDO, Fl. Paramush. p. 148. — *Primula nivalis* α *genuina* HERDER, Pl. Radd. Monopet. No. 76 in Acta Horti Petrop. I: 2 (1872) p. 388 et RADDE, Reisen IV: 1 p. 106 quoad pl. Kamtsch. — *Primula pumila* TURKEV. in Fl. As. Ross. I (1923) p. 38 quoad pl. Kamtsch. — *Primula pumila* var. *arctica* E. BUSCH in Fl. Sib. Orient. ext. IV (1926) p. 75 quoad pl. Kamtsch.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka (»Ohnweit der Lopatka») RIEDER 1831, do. W. coast June 22nd 1920 HN No. 117 (flowering).

My specimens from Cape Lopatka agree perfectly with *P. eximia* GREENE, the type specimen of which is illustrated by TAKEDA loc. cit. It differs so markedly from the type specimen of *P. tschuktschorum* KJELLMAN (in Hb. Holm.) that it seems quite impossible to unite the two plants as E. BUSCH loc. cit. does, as also FERNALD (Rhodora 30, 1928, p. 63 in nota). Characteristic features of *P. eximia* are: its robust growth, multiflowered umbels, farinose or at least rugulose umbel-rays, broad leaves (up to 2 cm.), large leafless sheaths at the rosula, farinose at an early stage and dark-blue corolla with usually non-emarginate limbs. *P. tschuktschorum* KJELLM. has more gracile growth, 1—2-flowered and not farinose umbels, only very slightly, if at all, gibbous involucral leaves, narrow, distinctly and characteristically denticulated leaves, no farinose sheaths at the rosula, and larger lilac-coloured corolla with emarginate

limbs. The last-mentioned characteristic may not be taken as a »character essentialis». A specimen collected, acc. to the label, by VOSSNESENSKY on Sept. 13th 1847 at »Tchumta» (situated on the »Pakiusu» river near »Kurilskaja Lopatka» acc. to VOSSNESENSKY's label on his specimen of *Pentstemon frutescens* in Hb. Acad. Petrop., not between Petropavlovsk and Bolsheredsk as stated by E. BUSCH loc. cit. p. 77), is in a young stage of development notwithstanding the late date of collection. It may therefore be regarded as somewhat doubtful, especially as *P. eximia* is a very early spring-plant and as it represents a somewhat doubtful form otherwise not known from our area.

Type of distribution: Northern Pacific.

Geographical area: The northern Kuriles, southernmost Kamtchatka, the Aleutian Islands, Pribilof Islands, and the Bering Strait area.

628. ***Primula farinosa*** L., Sp. pl. ed I (1753) p. 143.

HERDER, Pl. Radd. Monopet. No. 77 in Acta Horti Petrop. V: 2 (1872) p. 390 et RADDE, Reisen IV: 1 p. 108 (α *genuina*); TURKEV. in Fl. As. Ross. 1 (1923) p. 18 (var. *genuina*); E. BUSCH in Fl. Sib. Orient. extr. IV p. 39 (var. *genuina*, var. *xanthophylla*); KOM., Fl. Penins. Kamtsch. I pp. 38, 39. — *Primula longiscapa* KOM., Voy. Kamtch. pp. 413, 454 (non LEDEB.).

East Kamtchatka: Lake Kronoki KOMAROV 1909; »Kamsch. sopke» = Klutchevskaja volcano RIEDER 1831, do. July 19th 1927 P. T. NOVOGRABLENOF; Ustj-Kamtchatsk July 1925 MALAISE No. 511.

Central Kamtchatka: The sources of Gremushej R. KOMAROV 1909; Pushtchina KOMAROV 1909; Shtchapina KOMAROV 1909, do. July 22nd 1921 HN No. 3467 (MALAISE); the right Shtchapina R. KOMAROV 1909; Klutchi BEZAIS 1908 (Hb. Berol.), do. AFANASEJEF 1909, do. PROTOPOPOF 1909, do. June 3rd 1921 HN No. 3316 (MALAISE), do. June 12th 1921 HN No. 3327 (MALAISE).

West and North Kamtchatka: Pallan SAVTCHENKO 1911.

»Kamtchatka»: MERK, KEGEL and acc. to BUSCH loc. cit. STUBENDORFF.

Most of the specimens as far as I can see agree fairly well with Scandinavian specimens of *P. farinosa*, although, judging from the peculiar geographical area of the species, one might expect that the northern Asiatic plant would be distinct from the European. KOMAROV (loc. cit. p. 39) is of the opinion that it can be distinguished from the European plant.

Type of distribution: ?

Geographical area: In many types and forms: Europe: Scandinavia from southern Lapland southwards; the countries around the shores of the Baltic, Scotland and northern England, the Pyrenees and Central Spain, the Alps, the Carpathians and the Caucasus. Asia: N. Persia, mts. in Turkestan and Mongolia and from Chatanga R., lower Lena and Kolyma rivers and northern Kamtchatka southwards to northern Mongolia, Amur Prov., Ussuri and central Kamtchatka.

The Japanese plants referred to *P. farinosa* are regarded by TAKEDA as *P. modesta* (Notes Bot. Gard. Edinb. VIII, 1913 p. 88) and the corresponding American forms as several different species (Comp. FERNALD in Rhodora 30, 1928 pp. 58—104). Of these the Eastern American *P. laurentiana* FERNALD is very closely related to *P. farinosa.* E. BUSCH loc. cit. reports *P. farinosa* from Nova Zembla, Vaigatch and Archangelsk prov. — However, from the two first-mentioned places at any rate only the arctic circumpolar *P. stricta* HORNEM. is known.

629. ***Primula nivalis*** PALLAS, Reise versch. Prov. russ. Reich. III 1776) p. 723 tab. G. f. 2.

var. ***subintegerrima*** REGEL in Acta Horti Petrop. III (1875) p. 136.

TURKEW. in Fl. As. Ross. I (1923) p. 35; E. BUSCH in Fl. Sib. Orient. extr. IV (1926) p. 71. — *Primula nivalis* β *farinosa* HERDER, Pl. Radd. Monopet. No. 76 in Acta Horti Petrop. I: 2 (1872) p. 389 et RADDE, Reisen IV: 1 p. 107.

West and North Kamtchatka: Tigil RIEDER 1831, do. LEWITZKY 1848.

The above-enumerated specimens differ from *P. eximia* chiefly in being much more high-grown and in the leaves beeing farinose on the underside. It must be admitted that the line of demarcation between these two groups is still somewhat unclear. As I have seen too small a material of *P. nivalis* to have an own opinion on it I here follow the determinations of TURKEWITCH and BUSCH.

Type of distribution: ?

Geographical area: In several forms from N.E. Asia Minor, Caucasus, Altai, Stanovoi mts. and northern Kamtchatka, southwards to Kashmir, Sikkim and Yunnan.

Primula sibirica β brevicalyx.

LEDEB., Fl. Ross. III p. 14; HERDER, Pl. Radd. Monopet. No. 78 in Acta Horti Petrop. I: 2 (1872) p. 395 et RADDE, Reisen IV: 1 p. 113.

LEDEBOUR, and after him HERDER, reports REDOWSKY as having collected this plant in Kamtchatka. As REDOWSKY never visited the Kamtchatka Peninsula the report should be referred to »Kamtchatka Province» and the species must be excluded from the flora of our area.

630. ***Androsace filiformis*** RETZ., Obs. II (1781) p. 10.

HERDER, Pl. Radd. Monopet. No. 87 in Acta Horti Petrop. I: 2 (1872) p. 406 et RADDE, Reisen IV: 1 p. 124; MAXIM. in Bull. Ac. Imp. Sc. St. Petersb. XXXII (1888) p. 499.

South Kamtchatka: Lower Bolshaja R. 20 km. W. of Bolsheredsk July 6th 1921 HN No. 2008; Bolsheredsk KOMAROV 1908, do. July 8th 1921 HN No. 2019, do. July 10th 1921 HN No. 2104, do. June 13th 1922 HN No. 3796; Hutor RUBINSKI 1908; Savoiko KOMAROV 1908, do. June 10th 1928 MALAISE; Korjaka KOMAROV 1908.

Central Kamtchatka: Malka KOMAROV 1909 (Hb. Berol.); Ganala KOMAROV 1909; the Ganala mts. RIEDER 1831; Pushtchina KOMAROV 1909; between Pushtchina and Sharomsk RIEDER 1833; Shtchapina KOMAROV 1909; Tolbatchik July 15th 1921 HN No. 3439 (MALAISE); Klutchi BEZAIS 1908, do. June 18th 1921 HN No. 3359 (MALAISE).

West and North Kamtchatka: Kompakovaja ZELENIN 1909; Chairusovaja NOVIKOF 1909; Tigil LEVITZKY 1848.

»Kamtchatka»: LUBARSKY, KASTALSKY, KUSMISCHEFF, PETERS.

In South Kamtchatka *A. filiformis* was only observed in the river systems of Avatcha and Bolshaja (below the mouth of Bystraja R.). It flowers from the middle of June to the middle of July.

Type of distribution: ?Eurasiatic.

Geographical area: Europe: from Petersburg, Olonetz, Vologda and Perm prov. southwards to Orel, Tambov, Kazan and Orenburg. Asia: at Yenisej from about 70° N. lat., from lower Lena R. and Chukch Penins., southwards to Dshungaria, Mongolia, Manchuria, Corea and Kamtchatka, not known from Japan, Saghalin, the Kuriles or southernmost Kamtchatka. America: the corresponding American plant distributed from Washington to Montana and Colorado is regarded by RYDB., KNUTH and others as belonging to our species, but is considered by GREENE to belong to a separate species *A. capillaris* GREENE.

Androsace Gmelini (LAM.) GAERTN.

»*Cortusa calycibus corollam excedentibus*» L., Amoen. Acad. II ed. I (1751) p. 340 (Pl. Rar. Kamtsch. p. 8). — *Cortusa Gmelini* PENN., Arct. Zool. (1784) p. CXIV; GEORGI, Beschreib. III: 4 p. 764.

The above-cited records of this plant from Kamtchatka are all based on LINNAEUS' report. The species should be excluded from the flora of our area.

631. ***Androsace Lehmanniana*** SPRENG. in Isis I (1817) Heft 9 column 1289 tab. 9.[1]

Androsace Chamaejasme MERTENS, Bemerk. Fl. Koragins p. 64; KNUTH in ENGLER, Pflanzenr. IV: 237 (Heft 22) p. 190 (γ *arctica*); KUDO, Fl. Paramush. p. 148 (var. *capitata*, var. *paramushirensis*). — *Androsace villosa* var. ε *latifolia* HERDER, Pl. Radd. Monopet. No. 83 in Acta Horti Petrop. I: 2 (1872) p. 400 et RADDE, Reisen IV: 1 p. 118 quoad pl. Kamtsch.

Northern Kuriles: Paramushir M. AIZAWA 1900, KUDO 1920 acc. to KUDO loc. cit.

South Kamtchatka: Cape Lopatka east coast June 17th 1920 HN No. 14, do. west coast June 24th 1920 HN No. 106 b; Shadutka volcano 1125 m. Aug. 2nd 1921 HN No. 2591; Cape Piratkof RIEDER 1830 (sub. *A. villosa* var. *latifolia*); Topik 580 m. July 28th 1921 HN No. 2499; Lake Tolmachovaja

[1] Determined by Dr. H. HANDEL-MAZZETTI, Wien.

600 m. July 13th 1922 Hn No. 3926; mt. »Krasni Gor» Lake Natchika Komarov 1908; Shalsan July 26th 1848 Vossnesensky (sub *A. villosa*).

East Kamtchatka: Avatcha volcano Perfiljef 1910, do. 1000 m. Aug. 2nd 1920 Hn No. 718; Cape Koslov June 20—30th 1923 Malaise; the Kronoki Pass Komarov 1908; Klutchevskaja volcano 3000 feet Kozlovski 1909, do. N.E. slope Afanasejef 1909; Ploskaja volcano »pervaja na dolu sopotchka» Protopopof 1909.

Central Kamtchatka: The foot of Korjatskaja volcano Komarov 1908 (Hb. Berol.); Ganala Rieder 1831; the sources of Kashgan R., Pushtchina Komarov 1909; Anauna R. Aug. 18th 1926 Malaise No. 401, do. Aug. 19th 1926 Malaise No. 400, do. Sept. 5th 1926 Malaise No. 402.

West and North Kamtchatka: Karaginsk Island Postels, Mertens.

»Kamtchatka»: »e Kamtschatka Hb. Meyer» (sub *A. villosa*), Kegel, Kusmischeff, »Petropavlovsk Mertens», Peters.

A. Lehmanniana is not common in the alpine region of South Kamtchatka. It flowers from the beginning of June to the end of July. Handel-Mazzetti discusses the identity of the species and its relation to *A. Chamaejasme* in Notes Bot. Gard. Edinb. LXXV (1927) p. 281.

Type of distribution: Asiatic, transgressing into W. America.

Geographical area: Europe and Asia: from Vaigatch and the northern Urals eastwards to Chukch Penins. southwards to central Perm prov., ?mts. of Turkestan, Shansi, Chili and the southern Kuriles. America: Alaska, along the north coast to Victoria Land, on the south coast to Kodiak Island.

Androsace maxima L.

Herder, Pl. Radd. Monopet. No. 86 in Acta Horti Petrop. I: 2 (1872) p. 405 et Radde, Reisen IV: 1 p. 123.

Herder reports Kusmischeff as having collected this species in Kamtchatka. It is otherwise not known E. of Jakutsk distr. and should be excluded from the flora of our area.

632. ***Androsace septentrionalis*** L., Sp. pl. ed. I (1753) p. 142.

Cham. & Schlecht. in Linnaea I (1826) p. 216; Mertens, Bemerk. Fl. Koragins p. 64; Ledeb., Fl. Ross. III p. 19; Herder, Pl. Radd. Monopet. No. 84 in Acta Horti Petrop. I: 2 (1872) p. 402 et Radde, Reisen IV: 1 p. 120; Maxim. in Bull. Ac. Imp. Sc. St. Petersb. XXXII (1888) p. 501.

South Kamtchatka: Near Kambolnoje R. June 7th 1909 Bezais.

East Kamtchatka: Petropavlovsk Rieder 1833, do. Komarov 1908, do. mt. Meshenni Komarov 1909, do. July 4th 1920 Hn No. 201, do. June 1st 1921 Hn No. 1604, do. June 14th 1921 Hn No. 1703; the sources of Avatcha R. Rieder 1831; Cape Kozlof June 23rd 1923 Malaise; »Sewutchi Kamen» near Cape Olga, Malaise; Ustj-Kamtchatsk June 1st 1925 Malaise No. 512, do. June 20th 1925 Malaise No. 513.

Central Kamtchatka: Malka KOMAROV 1909 (Hb. Berol.); Kamtchatka Vershina KOMAROV 1909; Tolbatchik KOMAROV 1909.

West and North Kamtchatka: Tigil BEZAIS 1909; Pallan SAVTCHENKO 1911; Karaginsk Island acc. to MERTENS loc. cit.

»Kamtchatka»: LANGSDORFF, ESCHSCHOLTZ, ESCHSCHOLTZ and RIEDER (Hb. Berol.), CHAMISSO 1816 (Hb. Berol.), STEWART, KASTALSKY (Hb. Berol.), KUSMISCHEFF, MERTENS and RIEDER. (Most of these collectors certainly collected the species on Mt. Signalski in the harbour of Petropavlovsk.)

This plant flowers from the end of May to the end of June. Its frequency and distribution within our area is somewhat unclear.

Type of distribution: Circumpolar.

Geographical area: Europe: from central Scandinavia, Finland and Perm prov., southwards to middle Rhine, the western Alps, Switzerland, Roumania, Podolia and Orenburg, also in Caucasus and on Kolgujev (not recorded from Greenland or Iceland). Asia: from the mouth of Yenisei, Taimyr R., lower Lena R. and from Chukch Penins. southwards to Kashmir (acc. to KNUTH), Kansu, South Ussuri and south Kamtchatka (not reported from Japan or Saghalin). America from Alaska, Victoria Land, Ellesmereland and Labrador, southwards to New Mexico, Alberta, Hudson Bay and Gaspé Penins.

Androsace villosa L.

LEDEB., Fl. Ross. III p. 17; HERDER, Fl. Radd. Monopet. No. 83 in Acta Horti Petrop. I: 2 (1872) p. 398 et RADDE, Reisen IV: 1 p. 116; KNUTH in ENGLER, Pflanzenr. IV: 237 (Heft 22) p. 191.

The above reports of *A. villosa* from Kamtchatka were based on specimens (now in Hb. Acad. Petrop.) collected by REDOWSKY, who never visited the Peninsula. The species should be excluded from the flora of our area.

Samolus Valerandi L.

LEDEB., Fl. Ross. III p. 31. — »*Anagallis maritima folio glabro . . .*» GMEL., Fl. Sib. IV p. 87. — »*Anagallis* GM. Sib. IV 87, 37», PENNANT, Arct. Zool. (1784) p. CXIV.

The above records of *S. Valerandi* from Kamtchatka are all based on GMELIN's report. The plant should be excluded from the flora of our area.

Lysimachia nemorum L.

GEORGI, Beschreib. III: 4 p. 767; LEDEB., Fl. Ross. III p. 28.

GEORGI reports this plant from Kamtchatka after RUDOLPH. LEDEBOUR only cites GEORGI. *L. nemorum* is a European plant and it should be excluded from the flora of our area.

633. ***Lysimachia thyrsiflora*** L., Sp. pl. ed. I (1753) p. 147.

HERDER, Pl. Radd. Monopet. No. 97 in Acta Horti Petrop. I: 2 (1872) p. 302 et RADDE, Reisen IV: 1 p. 136; PAX & KNUTH in ENGLER, Pflanzenr. IV: 237 (Heft 22) p. 302. — *Naumburgia thyrsiflora* (L.) RCHB., KOM., Voy. Kamtch. pp.

130, 452. — *Lysimachia kamtschatica* GANDOGER in Bull. Soc. Bot. France LXV (1918) p. 58.

South Kamtchatka: Near Golygina village Aug. 7th 1921 HN No. 2737; lake near Paratunka KUSMISCHEFF (Hb. Fischer); the Paratunka »tundra» KOMAROV 1908; between Paratunka and Mikisha KOMAROV 1908; Bogatyrjovka July 16th 1920 HN No. 475; W. side of Lake Natchika KOMAROV 1908.

East Kamtchatka: Petropavlovsk at the lake July 10th 1928 W. EYERDAM.

Central Kamtchatka: Mashura KOMAROV 1909; Kurarotchnoje R. BEZAIS 1909.

»Kamtchatka»: »FISCHER misit 1829» (Hb. Berol.), KUSMISCHEFF, PETERS 1831, RIEDER 1833.

L. thyrsiflora is apparently rare in Kamtchatka. It flowers in July and August. *L. kamtschatica* Gand. is certainly nothing but an accidental form.

Type of distribution: Circumpolar.

Geographical area: Europe: from northernmost Scandinavia, northern Finland, W. Archangelsk and Vologda, southwards to England, E. France, the northern Alps, Austria, Transsylvania, Cherson, Saratov and Orenburg. Asia: at Yenisei from about 66° 30′ N. lat. (acc. to KRYLOF, Fl. Altaja, lower Lena R.) and Kamtchatka, southwards to northern Semipalatinsk, northern Mongolia, Yunnan (HANDEL-MAZZ. in Notes Bot. Gard. Edinb. LXXVII (1928) p. 121), Corea and Honshu. America: from Alaska (acc. to RYDB.) to Quebec southwards to N. California, Colorado, Illinois and Pennsylvania. A map of the distribution is given by HANDEL-MAZZETTI in Pflanzenareale Reihe 2 Heft 5 Karte 44.

634. ***Trientalis europaea*** L., Sp. pl. ed. I (1753) p. 344.

subsp. ***arctica*** (FISCH.) nov. comb. (LEDEB. pro var.).

»*Alsinanthemos caulibus ab imo foliosis . . .*» GMEL., Fl. Sib. IV p. 116 quoad pl. Kamtsch. — »*Alsinanthemos* GM. Sib. IV 116 No. 86» PENN., Arct. Zool. (1784) p. CXV. — *Trientalis europaea* CHAM. & SCHLECHT. in Linnaea I (1826) p. 224; HOOK. & ARNOTT in Beechy's Voy. p. 116; CHAMISSO, Reise u. d. Welt p. 347; ERMAN, Verzeichn. p. 54; MIYABE, Fl. Kuril. p. 250; YABE & YENDO, Fl. Shimushu p. (191). — »*Trientalis*» MERTENS, Bemerk. Fl. Koragins. p. 61. — *[Trientalis arctica* FISCH. ex. HOOK., Fl. bor. amer. II (1840) p. 121.] — *Trientalis europaea* β *arctica* (FISCH.) LEDEB., Fl. Ross. III p. 25; HERDER, Pl. Radd. Monopet. No. 93 in Acta Horti Petrop. I: 2 (1872) p. 414 et RADDE, Reisen IV: 1 p. 132; FEDTSCH., Fl. Îl. Comm. p. 91; KOIDZ. in Bot. Mag. Tokyo 25 (1911) p. 917; PAX et KNUTH in ENGLER, Pflanzenr. IV: 237 (Heft 22) p. 315 fig. 66 D; KUDO, Fl. Paramush. p. 149.

Northern Kuriles: Paramushir C. TARO 1892, T. MATSUBARA 1915, KUDO 1920 all acc. to KUDO loc. cit.; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Kurile Lake noted in A. 209; N.W. of Kurile Lake 600 m. noted in A. 210; N. of Kurile Lake noted in A. 211; lower Ozernaja R. noted in A. 96, A. 99, A. 100; Ozernaja village noted by Hn; N.E. of Javina village noted in A. 95; between Javina and Kochegochek noted in A. 91, A. 92; between Golygina and Kochegochek noted by Hn; upper Unkanakchek R. noted in A. 196, A. 197, A. 198, A. 202, A. 203, A. 204; Sahach noted in A. 191, A. 192; upper Kusingen R. noted in A. 189, A. 190; the junction of Golygina and Ksudach rivers noted in A. 89, A. 90; Golygina village noted by Hn; upper Ksudach R. noted in A. 84, A. 85; middle Ksudach R. noted in A. 86, A. 87; between the mouths of Opala and Golygina rivers noted by Hn; the divide between Shadutka and Ksudach rivers noted by Hn; N. of Shadutka noted in A. 80; Lake Sterbot noted in A. 216; the divide between Shadutka and Savan rivers noted in A. 81; Topik noted by Hn; N.W. of Assatcha Mts. noted in A. 178; Opala R., near Assatcha noted in A. 183, A. 184, A. 185; near the hot spring at upper Opala R. noted in A. 180, A. 181, A. 182; upper Udoshk R. noted in A. 78 b; Akhomten Bay Sept. 8th 1920 Hn No. 1189, do. noted in A. 24 b, A. 25, A. 27, A. 28, A. 29, A. 30, A. 35; Mutnovskaja volcano Aug. 8th 1922 Hn No. 4050; Gorelaja volcano noted no A. 165; W. of Opala volcano noted in A. 67, A. 68, A. 69, A. 71, A. 73, A. 76, A. 77, A. 78 a; do. 620 m. July 21st 1921 Hn No. 2257; Lake Tolmachovaja July 8th 1922 Hn No. 3876 b; the junction of Tolmachovaja rivers noted in A. 157; upper Abshen R. noted by Hn; near the mouth of Bolshaja R. Komarov 1909, do. July 3rd 1921 Hn No. 1928; lower Bolshaja R. noted in A. 105, A. 106, A. 107, A. 110, A. 111; the mouth of Balaganchik R. noted in A. 154; lower Karymchina R. noted in A. 123, A. 124, A. 151; Ipelka R. noted in A. 60; Agashka R. noted in A. 62, A. 63; Bolsheredsk noted by Hn; between Bolsheredsk and Apatcha noted in A. 113; Apatcha June 17th 1922 Hn No. 3813; lower Bannaja R. noted by Hn; upper (Paratunka-) Bystraja R. noted in A. 126, A. 127; Paratunka Komarov 1908, do. Savitch 1908 (Hb. Berol.); Lake Dalni Komarov 1908; the mouth of Paratunka R. Aug. 11th 1920 Hn No. 834; Mt. Stoll between Apatcha and Natchika noted in A. 121; Shalsan-Apatcha Vossnesensky 1847; mt. Tshapotchka, Natchika Komarov 1908; mt. Zerkalo, Natchika noted in A. 115, A. 118, A. 119; Hutor June 30th 1928 Malaise; Mt. Palovinaja 700 m., Savoiko July 8th 1920 Hn No. 338.

East Kamtchatka: Sierroglaska Rubinski 1909, do. Petropavlovsk Wright 1853—56, do. Bogdanovitsch 1898, do. Yokoyama acc. to Koidz. loc. cit., do. Gudzenko 1910, do. June 13th 1921 Hn No. 1670; the Kalashtyrka valley Komarov 1909; between Petropavlovsk and Avatcha volcano noted in A. 7, A. 9, A. 17, A. 18, A. 20, A. 23, A. 24 a, A. 42, A. 43; Avatcha volcano noted by Hn; the foot of Klutchevskaja volcano Kurtashof 1909; Ustj Kamtchatsk July 1925 Malaise No. 514, do. July 6th 1926 Malaise No. 515; »Vorgebirge des Schiwelutsch Ad. Erman (Cham.)» Hb. Berol.

Commander Islands: Bering Island: KJELLMAN, GREBNITZKY 1894 and acc. to FEDTSCH. loc. cit. STEJNEGER; Copper Island DYBOVSKY 1879 and acc. to FEDTSCH. loc. cit. STEJNEGER, GREBNITZKY, TILMAN and MOROZEVICZ.

Central Kamtchatka: Kosyrevsk PROTOPOPOF 1909; Klutchi BEZAIS 1909, do. AFANASEJEV 1909, do. June 19th 1921 Hn No. 3362 (MALAISE).

West and North Kamtchatka: Kompakovaja ZELENIN 1908; Tigil LEVITZKY; Pallan SAVTCHENKO 1911; Karaginsk Island acc. to MERTENS loc. cit.

»Kamtchatka»: LANGSDORFF, CHORIS, LUBABSKY, »MERK Herb. FISCHER» (Hb. Hort. Petrop.), CHAMISSO (Hb. Berol.), ESCHSCHOLTZ, KUSMISCHEFF (Hb. Holm.), FISCHER ded. 1821 (Hb. Berol.), STEWART, KASTALSKY, MERTENS, PETERS, RIEDER (Hb. Holm.).

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 68, A. 78 b, A. 84, A. 96, A. 100, A. 105, A. 107, A. 115, A. 119, A. 182, A. 184, A. 185, A. 190, A. 191); Sparse (A. 67, A. 69, A. 86, A. 92); Scattered (A. 91).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 113, A. 124, A. 151).

In *Betula platyphylla—Thalictrum—Carex* ass.:
Single (A. 154, A. 157).

In *Betula Ermani—Filipendula—Dryopteris* ass.:
Single (A. 30, A. 62, A. 63, A. 196, A. 197); Sparse (A. 24 a, A 115); Scattered (A. 180).

In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 7, A. 23, A. 42, A. 43, A. 106); Sparse (A. 9, A. 17, A. 18, A. 183).

In *Betula Ermani—Filipendula—Equisetum hiemale* ass.:
Single (A. 89, A. 90).

In *Vaccinium—Empetrum*—Moss ass.:
Single (A. 95).

In *Carex—Myrica—Sphagnum* ass.:
Single (A. 20, A. 111).

In *Carex—Myrica* ass.:
Single (A. 110).

In *Filipendula—Calamagrostis—Sanguisorba* ass.:
Sparse (A. 85).

In *Carex—Sanguisorba*—Moss ass.:
Single (A. 60, A. 87, A. 123, A. 181); Sparse (A. 192).

In *Alnus—Calamagrostis—Dryopteris* ass.:
Single (A. 99, A. 189, A. 198, A. 202, A. 204); Sparse (A. 76, A. 126, A. 209).

In *Alnus—Glyceria—Athyrium* ass.:
Single (A. 27, A. 35, A. 127, A. 203); Sparse (A. 28).
In *Alnus—Calamagrostis—Veratrum* ass.:
Sparse (A. 165, A. 178).
In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Single (A. 216); Sparse (A. 24 b); Scattered (A. 25).
In *Pinus pumila—Spiraea—Sphagnum* ass.:
Single (A. 121).
In *Pinus pumila—Rhododendron*—Moss ass.:
Single (A. 81).
In *Pinus pumila—Spiræa*—Moss ass.:
Single (A. 29).
In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Single (A. 77, A. 78 a, A. 118, A. 210, A. 211).
In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 73, A. 80); Scattered (A. 71).

In South Kamtchatka *T. europaea* subsp. *arctica* is one of the most common plants. In the lowlands it occurs constantly in all kinds of meadows and *Betula* forests and also, although less constantly, in wetter associations, and occasionally in the heaths. In the *Alnus* region it is common in the undergrowth throughout the region and also, although less constantly, in the *Pinus pumila* thickets. In the lower alpine region it occurs in the meadows up to an altitude of about 1000 m.

The difference between subsp. *arctica* and the head-form is not very distinct. Undoubtedly, however, the American material forms, together with the Eastern Asiatic, a separate and comparatively distinct race of the species characterized by more numerous and larger cauline leaves, all leaves more obtuse, mucronated, pedicels more distinctly glandulose and petals on an average broader and not so evenly tapering to the apex. As *T. europaea* is a very variable plant, the above-mentioned differences may lie within the latitude of variation in the European plant also, but there they do not occur together, forming a type, as they do in Eastern Asiatic and American specimens. As it has not been possible so far to claim for it any distinct characteristics, I think it best to regard the plant as a geographical race of *T. europaea.*

Type of distribution: The head-form: Eurasiatic. Subsp. *arctica:* Northern Pacific or Eastern Asiatic—Western American.

Geographical area: The head-form: Europe: from Iceland, northernmost Scandinavia, Kolgujef and the northern Urals, southwards to northern England, western France, the Alps and southern Russia. Asia: at Yenisei from about 67° N. lat. and from lower Lena R., southwards to northern Mongolia and (?)Corea. Subsp. *arctica:* Asia: ?Chukch Penins., Ochotsk, Kamtchatka, Saghalin, the Kuriles, Yezo and Honshu (the western limit is uncertain). America: the Aleutian Islands, Alaska to Yukon and Oregon.

Plumbaginaceae Lindl.

635. ***Armeria vulgaris*** Willd., Enumer. Hort. Berol. I (1806) p. 333.

Herder, Pl. Radd. Monopet. No. 607 (348) in Acta Horti Petrop. X: 1 (1887) p. 53. (»*arctica* und *arctica maritima*»). Yabe & Yendo, Fl. Shimushu p. (192); Kudo, Fl. Paramush p. 15 (f. *arctica*). — *Statice pubescens* Mertens, Bemerk. Fl. Koragins p. 64.

Northern Kuriles: Paramushir M. Aizawa 1900, T. Sakurai 1910 acc. to Kudo loc. cit. Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka Rieder, do. June 17th 1920 Hn No. 29, do. June 22nd 1920 Hn No. 107.

East Kamtchatka: Klutchevskaja volcano 3600 feet Bezais 1909, do. Afanasejef 1909, do. 4500 feet Kozlovski 1909, do. Aug. 5th 1927 Malaise; Ploskaja volcano, »pervaja na dolu sopotchka» Protopopof 1909.

Central Kamtchatka: Tolbatchik Bezais 1908; Kresti Protopopof 1908.

West and North Kamtchatka: Karaginsk Island Postels and acc. to Mertens loc. cit.

»Kamtchatka»: Kegel, Bogdanowitsch.

The Kamtchatka specimens of this plant have the calyx hairy only on the veins and thus belong to var. *arctica* Cham. & Schlecht.

The species includes several puzzling forms which are not yet cleared up. The arctic, circumpolar plant is often taken to be a separate species, *A. sibirica* Turcz., but it seems difficult to find any characteristics by which it can be specifically distinguished from the Central European plant. Even the South American specimens were united by Skottsberg (Sv. Vet. Akad. Handl. 56 No. 5 p. 285) after a careful comparison with the European plant.

Type of distribution: ?

Geographical area: In several forms: Europe: Iceland, Kola Penins., Kolgujef, Nova Zembla and the arctic Russian mainland. Also in Southern Scandinavia and Finland, the Baltic States, Polonia, Germany, Austria, the eastern Alps. England and Scotland. In the Alps the closely related *A. alpina* Willd. Asia: along the North Coast to Chukch Penins., southwards to the Baikal mts., Jakutsk distr., Primorsk prov. and the northern Kuriles. America: from Alaska to Ellesmereland and Labrador, southwards on the Pacific coast to California. Also in Patagonia and Tierra del Fuego. E., W. and N. Greenland.

Gentianaceae Dum.

636. ***Gentiana algida*** Pallas, Fl. Ross. I: 2 (1788) p. 107, tab. 95.

Georgi, Beschreib. III: 4 p. 833; Bunge in Nouv. Mem. Soc. Imp. Nat. Mosc. I (1829) p. 214; Kusnetz. in Acta Horti Petrop. XV (1898) p. 259 (α *sibirica*) et 263 (β *Romanzowii*). — *Gentiana frigida* Griseb., Gen. Spec. Gentian. p. 278 (β *algida*); Ledeb., Fl. Ross. III p. 65 (γ *algida*); Herder, Pl. Radd. Monopet. No. 125 in Acta Horti Petrop. I: 2 p. 453 et Radde, Reisen IV: 1 p. 171 (α *genuina*) quoad pl. Kamtsch.

South Kamtchatka: Cape Lopatka collected by cossacks 1909. »Auf der Lopatka den Ganalschen und Opalaschen Gebirgen» Rieder 1833.

East Kamtchatka: Mt. Koselj, Avatcha volcano collected 1920 by hunters following the writer (the specimen was later lost); Mt. Krasheninnikof Komarov 1909 (Hb. Berol.); Lake Kronoki 900 m. Sept. 12th 1921 Hn No. 3605 (Malaise); the Kronoki Pass Komarov 1909; Klutchevskaja volcano at the foot Kurtashof, do. 5000 feet Kozlovski 1909, do. 3200 feet Bezais 1909, do. Afanasejev 1909, do. Aug. 5th 1927 Malaise.

Central Kamtchatka: Korjatskaja volcano Aug. 2nd 1925 Malaise, do. Aug. 13th and 14th 1928 W. Eyerdam; Gremushej R. Komarov 1908; Anauna R. Sept. 3rd 1926 Malaise No. 391, do. Sept. 5th 1926 Malaise No. 392 (with the note »common on all mts.»).

»Kamtchatka»: Kegel (sub *G. frigida*).

This high-alpine plant is rare in South Kamtchatka but seems to be common in the high mountains of the northern part of the peninsula.

Kamtchatka specimens are usually low-grown and one- to two-flowered They belong to var. *Romanzowii*, which seems to pass gradually into the more high-grown and multi-flowered var. *sibirica*.

Type of distribution: Asiatic transgressing into western N. America.

Geographical area: Asia: from Altai, Tianshan and Kashmir eastwards, in the north from the Baikal mts., Jakutsk distr., lower Kolyma R. and Chukch Penins. southwards to Sikkim (in Tibet and Himalaya var. acc. to Kusnetz.), Sze-ch'uan, Jablonoj mts. and southern Kamtchatka, also on Honshu. America: from Alaska to Montana, Colorado and Utah. In Europe (Steyermark, the Carpathians, Siebenburgen) the closely related *G. frigida* Haenk., which is regarded by Kusnetzow loc. cit. as a variety of our species.

Gentiana amarella L.

Pennant., Arct. Zool. (1784) p. CXV; Herder, Pl. Radd. Monopet. No. 109 in Acta Horti Petrop. I: 2 (1872) p. 427 et Radde, Reisen IV: 1 p. 145.

Pennant's report of *G. amarella* from Kamtchatka is doubtless due to a misinterpretation of Gmelin's »*Gentiana corollis quinquefidis hypocrateriformibus . . .*» (Gmel., Fl. Sib. IV p. 106), which evidently refers to *G. auriculata*. Herder's report reads »aus Kamtschatka (herb. ross.)» and as locality and collector are

wanting, is not very trustworthy. The species that occurs N. of Kamtchatka is not known from our area with any certainty.

637. ***Gentiana auriculata*** PALLAS, Fl. Ross. I: 2 (1788) p. 102 tab. 42 fig. 1.

GEORGI, Beschreib. III: 4 p. 834; CHAM. in Linnaea VI (1831) p. 589; ERMAN, Verzeichn. p. 61; GRISEB., Gen. Spec. Gentian. p. 247; LEDEB., Fl. Ross. III p. 55; HERDER, Pl. Radd. Monopet. No. 110 in Acta Horti Petrop. I: 2 (1872) p. 431 et RADDE, Reisen IV: 1 p. 149; YABE & YENDO, Fl. Shimushu p. (192); FEDTSCH., Fl. Îl. Comm. p. 92; KUDO, Fl. Paramush. p. 150. — »*Gentiana corollis quinquefidis hypocrateriformibus . . .*» GMEL., Fl. Sib. IV p. 106 quoad pl. Kamtsch. — »*Gentiana*» DITMAR, Reisen I p. 552.

Northern Kuriles: Paramushir C. TARO 1892, I. KODAMA 1893, T. SAKURAI 1910, KUDO 1920 all acc. to KUDO loc. cit., Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka RIEDER 1831, do. BJELOUSSOF 1914; S. of Kambolnaja R. RUBINSKI 1909; Kurile Lake Aug. 28th 1922 HN No. 4446; »Oxernoi» (= Ozernaja) Hb. Sapporo; near the mouth of Ozernaja R. GUDZENKO 1910; on the shore between Javina and Kochegochek Aug. 14th 1921 HN No. 2867; middle Kidipalok R. noted by HN; upper Unkanakchek R. Aug. 21st 1922 HN No. 4351; Kuseten R. Aug. 17th 1922 HN No. 4287; Sahach noted in A. 191; Golygina river VOSSNESENSKY; middle Ksudach R. Aug. 5th 1921 HN No. 2668, do. Aug. 6th 1921 HN No. 2720; between the mouths of Opala and Golygina rivers noted by HN; Lake Sterbot noted in A. 216; the mouth of Artemjeva R. Sept. 15th 1922 HN No. 4609 (A. 221); between Mutnovskaja and Assatcha 700 m. July 30th 1922 HN No. 4067 (var.); S. of Zykovaja noted in A. 217; upper Udoshk R. 200 m. July 26th 1921 HN No. 2432 (var.); the mouth of Bolshaja R. KOMAROV 1908; lower Bolshaja R. noted in A. 105, A. 107; lower Bannaja R. noted in *Angelica*-meadow by HN; Toporkoff Island Aug. 8th 1920 HN No. 796 (var.); Ozdets R. KOMAROV 1908 (also f. *flor. albis*); Mt. Tshapochka, Natchika KOMAROV 1908; Natchika village KOMAROV 1908; Savoiko KOMAROV 1908, do. Aug. 4th 1928 W. EYERDAM, do. Aug. 24th 1928 MALAISE; Korjaka VOSSNESENSKY, do. KOMAROV 1908.

East Kamtchatka: The entrance of Avatcha Bay PERFILJEF 1910; Petropavlovsk KASTALSKY, do. MERTENS, do. KOMAROV 1908, do. noted in A. 6, do. Aug. 26th 1928 W. EYERDAM; Kalashtyrka, the mouth of Palovinaja R. PERFILJEF 1910 (var.); Avatcha volcano 690 m. July 31st 1920 HN No. 635; Uzon KOMAROV 1909; Lake Kronoki KOMAROV 1909, do. Aug. 31st 1921 HN No. 3547 (MALAISE); Klutchevskaja volcano KURTASHOF 1909; Ustj-Kamtchatsk BEZAIS 1908, do. July 1925 MALAISE No. 520, do. Aug. 17th 1925 MALAISE No. 519, do. Aug. 25th 1925 MALAISE No. 518 and 517 (f. *flor. albis*).

Commander Islands: Bering Island Dybovsky 1879, Grebnitzky 1880, Gudzenko 1910; Copper Island Dobrotvorsky 1881, Tkatchenko Aug. 26th 1911 (Hb. Holm.).

Central Kamtchatka: Korjatskaja volcano Aug. 12th 1928 W. Eyerdam; Ganala Rieder 1833; Shtchapina Komarov 1909; Tolbatchik Komarov 1909; Anauna R. Aug. 18th 1926 Malaise No. 397, do. Aug. 22nd 1926 Malaise No. 393 and 398; Kosyrevsk Grinop 1909; Kresti Bezais 1908.

West and North Kamtchatka: Kishtchik Rubinski 1908; Chairusovaja Novikof 1908; Tigil »Ad Erman Hb. Cham.», do. Levitzky; Pallan Savtchenko 1911.

»Kamtchatka»: Steller acc. to Pallas loc. cit., Merk, Eschscholtz, Wormskjold (Hb. Mertens), Kegel, Rastargujeff, Stewart, Kusmischeff, Kastalsky, Peters, Dybovsky.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 105, A. 107, A. 191).
In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Single (A. 216, A. 217).
In *Carex—Sanguisorba*—Moss ass.:
Single (A. 221).

In South Kamtchatka *G. auriculata* inhabits the lowland meadows and the meadows of a subalpine type that chiefly occurs on the sandy »koshka» along the western coast. Sometimes it is also found in wet meadow-like associations.

It is an extremely variable plant. In its commonest form it is a plant about 15 cm. high, strongly branched in its upper part. The lower leaves are usually obtuse and the upper more acute, but forms with all leaves acute also occur (Hn No. 4609). The corolla is about 2 cm. long and the capsules about 3 cm. Unbranched one-flowered specimens occur with stem only 1 cm. high and flowers 1 cm. long, as well as unbranched multi-flowered forms more than 40 cm. high, with dark-coloured calyx and shorter corolla in comparison with the calyx. The length of the pedicels varies considerably. The flowers are sometimes white. The specimens Hn No. 2432 are very peculiar. They have light-green branches and are highgrown with yellow corolla enclosed in and shorter than the calyx. All the leaves are obtuse. As they agree in all details — for instance in the extremely fine serrulation of the leaves, in the form of the calyxlobes and corolla — with *G. auriculata*, I think that they are a teratological form of that species. Hn No. 4067 and some of those from Ustj Kamtchatka are closely akin to this type.

Hn No. 796 represents another very peculiar type with the broad ovate-lanceolate leaves concentrated towards the top of the stem and thus including the short-pedicellate flowers in a kind of involucrum. The corolla is tetramer-

ous and shorter in comparison with the calyx than in typical *G. auriculata*. These specimens agree comparatively well with the description of *G. aleutica* CHAM. & SCHLECHT. of which I have not seen any specimens. The plant is certainly at least a variety of *G. auriculata*, or possibly a separate species. I will not give it a separate name before the question of its identity with *G. aleutica* is settled. The specimens from the mouth of the Palovinaja R., Kalashtyrka, and some of those from Commander Islands, closely resemble this type.

Type of distribution: Asiatic Pacific.

Geographical area: From ?Chukch Penins., Gishiginsk distr. and Baron Korf Bay, southwards over Ochotsk, the mouth of Amur R. and Saghalin to N.W. Yezo and over Kamtchatka and Commander Islands to the southern Kuriles, also on Honshu. *G. aleutica* in the Aleutian Islands.

Gentiana aquatica L.

PENNANT, Arct. Zool. (1784) p. CXV. — »*Gentiana foliis margine membranaceis basi coadunatis*» L., Amoen. Acad. II p. 343 (Pl. Rar. Kamtsch. p. 11).

The report of this plant from Kamtchatka is founded on LINNAEUS' record in Amoen. Acad. II. Like several other of these reports, it is doubtful, and the species should most probably be excluded from the flora of our area.

Gentiana detonsa FR. β **barbata.**

HERDER, Pl. Radd. Monopet. No. 116 in Acta Horti Petrop. I: 2 (1872) p. 439 et RADDE, Reisen I: 2 p. 157.

HERDER reports this plant as having been collected in Kamtchatka by MERK, adding a mark of interrogation. The plant should be excluded from the flora of our area.

638. ***Gentiana glauca*** PALLAS, Fl. Ross. I: 2 (1788) p. 104, tab. XCIII fig. 2.

GEORGI, Beschreib. III: 4 p. 833; CHAMISSO in Linnaea I (1826) p. 175; BUNGE in Nouv. Mem. Soc. Imp. Nat. Mosc. I (1829) p. 239; GRISEB., Gen. Spec. Gentian. p. 247; LEDEB., Fl. Ross. III p. 66 (β *major*); HERDER, Pl. Radd. Monopet. No. 126 in Acta Horti Petrop. I: 2 (1872) p. 454 et RADDE, Reisen IV: 1 p. 172 (α *minor*, β *major*); KUZNETS. in Acta Horti Petrop. XV (1898) p. 279; FEDTSCH., Fl. Îl. Comm. p. 92. — »*Gentiana* mit schön dunkelblaugrünlichen Blüthen» KITTLITZ, Denkw. II p. 340. — »*Enzian*» DITMAR, Reisen I p. 254.

South Kamtchatka: Illina volcano 600 m. Aug. 23rd 1922 HN No. 4395; upper Kidipalok R. Sept. 4th 1922 HN No. 4487; Akhomten Bay 500 m. Sept. 13th 1920 HN No. 1474, do. 660 m. Sept. 18th 1920 HN No. 1496; between Gorelaja volcano and Assatcha 700 m. July 30th 1922 HN No. 4068; Opala volcano 1040 m. July 21st 1921 HN No. 2345; Lake Tolmachovaja 800 m. July 11th 1922 HN No. 3886; middle Tolmachovaja R. 570 m. noted by HN; mt. Babi Kamen, Paratunka KOMAROV 1908; mt. Trubi, Vilju R. KOMAROV 1909; Shalsan VOSSNESENSKY 1847; Ozdets R. KOMAROV 1908; mt. Tshapochka, Natchika KOMAROV 1908 (Hb. Berol.); Natchika 820 m. Sept. 3rd 1921

Hn No. 3033; mt. Palovinaja, Savoiko July 8th 1920 Hn No. 297, do. July 22nd 1928 Malaise, do. July 26th 1928 W. Eyerdam; the sources of Poperochnaja R. Komarov 1908.

East Kamtchatka: The Penishiva Pass July 28th 1928 W. Eyerdam; Cape Shipunski acc. to Ditmar loc. cit.; Kishpinitch volcano Komarov 1909; mt. Krasheninnikof Komarov 1909; Lake Kronoki 900 m. Sept. 12th 1921 Hn No. 3603 a (Malaise); the Kronoki Pass Komarov 1909; Chartchina mts. Aug. 12th 1927 Malaise.

Commander Islands: Bering Island Steller acc. to Pallas loc. cit., Kjellman, Dybovsky 1879, Gudzenko 1910 and acc. to Fedtsch. loc. cit. Stejneger, Grebnitzky and Morozevicz.

Central Kamtchatka: Korjatskaja volcano Komarov 1908; the Ganala »tundra» Komarov 1909; the Ganala mts. Kittlitz; Kunchekla Protopopof 1909; Anauna R. Aug. 19th 1926 Malaise No. 394, 395, 396.

West and North Kamtchatka: Tigil Levitzky; between Sedanka and Jelovka Bezais 1909; Vojampolka Levitzky 1849; Karaginsk Island Mertens.

»Kamtchatka»: Lubarsky, Stewart, Kusmischeff, Rieder.

G. glauca is not rare in the alpine region of South Kamtchatka. It was never observed at a lower altitude than 500 m.

Type of distribution: Eastern Asiatic—Western American.

Geographical area: Asia: from Olenek river eastwards to Chukch Penins., southwards to Jakutsk distr., Gishiga, the Kuriles (to Urup) and Commander Islands. Also on N.W. Yezo. America: Alaska (from Kotzebue Sound) to Montana and British Columbia.

Gentiana pneumonanthe L.

Chamisso in Linnaea VI (1831) p. 589; Erman, Verzeichn. p. 60; Ledeb., Fl. Ross. III p. 66; cfr. Herder, Pl. Radd. Monopet. No. 128 in Acta Horti Petrop. I: 2 p. 456 et Radde, Reisen IV: 1 p. 174.

Chamisso (in Erman loc. cit.) reports this plant as having been collected in South Kamtchatka by Rieder. It is otherwise not known with certainty east of Yeniseisk prov. and should most probably be excluded from the flora of our area.

639. ***Gentiana prostrata*** Haenke in Jacq., Collect. II (1788) p. 66 tab. 17 f. 2.

Central Kamtchatka: Anauna R. Aug. 18th 1926 Malaise No. 387.

This plant belongs to a very critical group containing several Asiatic and American species, which can hardly be cleared up without monographical treatment. The species is thus dealt with here in the wide sense. The seeds, which are not ripe in the specimens collected by Malaise, are, however, clearly winged. The specimens do not belong to *G. humilis* Stev.

Type of distribution: Eurasiatic, transgressing into W. America.

Geographical area: *G. prostrata* sens. lat. Europe: the Alps. Asia: from Pamir eastwards, in the north from Altai, lower Olenek R. and Chukch Penins., southwards to China, Pei-Shan and central Kamtchatka. America: (»*Condrophylla americana*») from Alaska to Alberta and Colorado. Also in S. America several closely related forms.

Gentiana purpurea L. β **camtschatica.**

GRISEB., Gen. Spec. Gentian. p. 297; GRISEB. in DC., Prodr. 9 p. 116; LEDEB., Fl. Ross. III p. 68; KUSNETS. in ENGLER u. PRANTL, Nat. Pflanzenfam. IV: 2 p. 81.

A specimen of *G. purpurea* in hb. HOOKER (Hb. Kew) was described by GRISEBACH loc. cit. as a separate Kamtchatka variety. It is supposed to have been collected in Kamtchatka by WORMSKJOLD. Throughout the two years during which WORMSKJOLD visited Kamtchatka he was kept practically a prisoner at Petropavlovsk, and if he had collected the species himself it must have been in the neighbourhood of that town. Later, however, no trace of this large and remarkable plant has been found in Kamtchatka. Its chief area is in the Alps, but it also occurs in some districts in Norway and was reported from Siebenburgen, although that report has not been confirmed. Some caution is therefore natural, as the distribution is strongly disjunct. It must be said, however, that otherwise there is no evidence that the report is correct. It may have been caused by a confusion of labels. The species should most probably be excluded from the flora of our area.

640. ***Gentiana tenella*** ROTTBOELL in Skr. Kiöb. Selsk. X (=Vidensk.-Selsk. Skrift.) (1770) p. 436.

HERDER, Pl. Radd. Monopet. No. 111 in Acta Horti Petrop. I: 2 (1872) p. 432 et RADDE, Reisen IV: 1 p. 150.

East Kamtchatka: The Kronoki Pass KOMAROV 1909.

Central Kamtchatka: Anauna R. Aug. 18th 1926 MALAISE No. 389, do. Aug 19th 1926 MALAISE No. 390, do. Sept. 5th 1926 MALAISE No. 388.

»Kamtchatka»: »Herb. MERTENS» acc. to HERDER loc. cit.

The specimens agree well with the Scandinavian. The plant is apparently rare in Kamtchatka.

Type of distribution: Eurasiatic—Western American.

Geographical area: Europe: Iceland, the Scandinavian mts., Spitzbergen (Wijde Bay), E. Kola Penins., arctic Russia, Nova Zembla, N. Spain, the Pyrenees, the Alps, the Carpathians and Siebenburgen. Asia: along the Arctic Coast to Chukch Penins., southwards in the high mts. to Afghanistan, Kashmir, (part of the central Asiatic specimens may belong to *G. minutissima* BOISS.), Tian-Shan, Sikkim, (var.) northern Mongolia, Transbaikalia, Jakutsk distr. and Kamtchatka. America: reported from Kotzebue Sound and Alaska. Not enumerated in RYDB., Fl. Rocky Mts., but I have seen a specimen from Colorado which seems to be identical with or in any case very closely related to *G. tenella*. Also W. Greenland (between 66° 50′ and 68° 21′ N. lat.) and E. Greenland (about Scoresby sound).

641. ***Gentiana*** sp.

Malaise reports in a letter that he has seen a specimen of a *Gentiana* about 30 cm. high with 30—35 mm. long bright-blue flowers which was collected in the country inhabited by the lamuts in the central mountain range. A species which this description suits and which might be expected in the northern part of our area is *Gentiana barbata* Froel. It seems less probable that it is a *Gentiana pneumonanthe.*

642. ***Lomatogonium carinthiacum*** (Wulf.) Reichenb., Fl. Germ. Excurs. (1831) p. 421.

Gentiana Stelleriana Cham. & Schlecht. in Linnaea I (1826) p. 188. — [*Swertia carinthiaca* Wulfen in Jacq., Misc. II (1781) p. 53 t. 6.] — *Pleurogyne carinthiaca* Griseb., Ledeb., Fl. Ross. III p. 71.

East Kamtchatka: Kishpinitch volcano Komarov 1909; the Kronoki Pass Komarov 1909 (Hb. Berol.), do. Aug. 30th 1921 Hn No. 3527 (Malaise).

»Kamtchatka»: »circa mare Ochotense, (Steller)» acc. to Cham. & Schlecht. loc. cit.

Type of distribution: Eurasiatic—Western American.

Geographical area: Europe: the Alps, E. Carpathians, central Caucasus and Dahgestan. Asia: mts. of Afghanistan and Pamir eastwards, in the north from Narym mts., Tarbagatai, Altai, Transbaikalia and Ochotsk, in the south to Kashmir, the Himalayas and Chili; also in E. Kamtchatka. America: the mouth of Mackenzie R. (acc. to Macoun & Holm). E. America? In China and the Himalayas closely related species.

643. ***Lomatogonium rotatum*** (L.) Fries ex Nym., Consp. Fl. Europ. III (1881) p. 500.

[*Swertia rotata* L., Sp. pl. ed. I (1753) p. 226]. — *Pleurogyne rotata* Griseb., Herder, Pl. Radd. Monopet. No. 134 in Acta Horti Petrop. I: 2 (1872) p. 463 et Radde, Reisen IV: 1 p. 181.

Central Kamtchatka: The Kronoki Pass Komarov 1909; the path between Shtchapina and Kronoki Komarov 1909 (Hb. Holm.); the hot spring »Kipploje» Shtchapina Komarov 1909 (Hb. Berol.); Tolbatchik Bezais (Hb. Berol.), do. Komarov 1909; the hot spring at Anauna R. Aug. 22nd 1926 Malaise No. 399 (with a note: »Common on alluvial meadows at middle Kosyrevsk-Bystraja valley . . . not observed in the mountains»); Kresti acc. to Malaise in litt.

»Kamtchatka»: Merk, Kegel.

Kamtchatka specimens are narrow-leaved and thus belong to f. *tenuifolium* (Griseb.) Fern.

The generic name is discussed by Fernald in Rhodora 21 (1919) p. 197.

Type of distribution: Circumpolar.

Geographical area: Europe: Iceland, E. Kola Penins., the arctic Russian

mainland. Asia: from Tarbagatai, E. Altai, Vilju distr. and lower Olenek R. eastwards; to the south to Shansi, Chili, mts. of Amur prov., Ajan and Central Kamtchatka. America: from Kotzebue Sound and Bathurst Inlet, southwards to Colorado (39° N. lat.) and the western shore of Hudson Bay, and from Labrador 55° N. lat. to Newfoundland, St. Lawrence Bay and Magdalen Island (47° N. lat.). W. Greenland northwards to 69° N. lat. A map of (most of) the area is given by FERNALD in Mem. Gray Herb. II 1925 p. 339.

Anagallidium dichotomum GRISEB.

»*Swertia corollis quadrifidis ecornibus*» L., Amoen. Acad. II ed. I p. 345 (Pl. Rar. Kamtsch. p. 13); *Swertia dichotoma* PENNANT, Arct. Zool. (1784) p. CXV.

This plant, which is not known E. of Transbaikalia, should be excluded from the flora of our area.

Swertia perennis β obtusa LEDEB.

HERDER, Pl. Radd. Monopet. No. 141 in Acta Horti Petrop. I: 2 (1872) p. 470 et RADDE, Reisen IV: 1 p. 188.

HERDER reports MERK as having collected this plant in Kamtchatka. As it occurs at Ochotsk, which is situated in the Kamtchatka province, the record may as well refer to that place and not to the Kamtchatka Peninsula. The report needs confirmation. The species, however, might well be expected within our area.

644. ***Swertia tetrapetala*** PALL., Fl. Ross. I: 2 (1788) p. 99 tab. 90 fig. 2.

GEORGI, Beschreib. III: 4 p. 831; YABE & YENDO, Fl. Shimushu p. (192); KOM., Voy. Kamtch. p. 415 et Fl. Penins. Kamtsch. I p. 333; KUDO, Fl. Paramush. p. 150. — *Stellera cyanea* TURCZ. in Bull. Soc. Nat. Mosc. 13 (1840) p. 168; LEDEB., Fl. Ross. III p. 33. — *Rellesta cyanea* TURCZ. in Bull. Soc. Nat. Mosc. 22 (1849) p. 337; HERDER, Pl. Radd. Monopet. No. 137 in Acta Horti Petrop. I: 2 (1872) p. 467 et RADDE, Reisen IV: 1 p. 185.

Northern Kuriles: Paramushir C. TARO 1892, T. KODAMA 1893, T. MATSUBARA 1915, KUDO 1920 all acc. to KUDO loc. cit.; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka RIEDER 1831; Kurile Lake in meadow noted by HN; the mouth of Ozernaja R. GUDZENKO; Ozernaja village noted by HN; »Oxernoi» (= Ozernaja) Hb. Sapporo; Javina RUBINSKI 1909; between Javina and Kochegochek Aug. 14th 1921 HN No. 2866 (A. 91, A. 92); near the junction of Kisipalok and Kidipalok rivers noted by HN; S. of Kochegochek noted by HN; Sahach Aug. 16th 1922 HN No. 4283 (A. 191); upper Kusingen R. noted in A. 190; Golygina R. 50 verst from the mouth, 25 verst from the village RUBINSKI 1909; lower Golygina R. below the junction with Ksudach R. noted by HN; Golygina village VOSSNESENSKY 1847 (sub *Rellesta cyanea*), do. noted in heath by HN; upper Ksudach R. in meadow noted by HN; middle Ksudach R. 100 m. Aug. 5th 1921 HN No. 2674 a and b (f. flor. albis); »in uno saltem loco, ad ostium Apallae fl. in dextra ripa elata, ostio opposita

observavit» (= the mouth of Opala R.) STELLER acc. to PALLAS loc. cit. (type locality of the species); between the mouths of Golygina and Opala rivers noted by HN; upper Savan R. 250 m. July 31st 1921 HN No. 2536 (A. 79); middle Opala R. 100 m. July 27th 1921 HN No. 2436.

»Kamtchatka»: »Kamtchatka et ins. Kuril PALLAS» (recently added in Russian »Collected by MERK»); »Herb. FISCHER *Rellesta cyanea*»; »Habitat in Kamtchatka ⊙» WILLD. Herb. No. 5480 (on the sheet is added »PALL. W.»); »Kamtschatka 1848 LEVITZKY *Anagallidium dichotomum*» (Not original label. The report of *S. tetrapetala* from Tigil found in TURCZ. loc. cit. was probably based on this specimen. It is, however, evident that LEVITZKY, who collected in Tigil, also obtained a small collection from south Kamtchatka, which was originally labelled only »Kamtchatka», whereas his own plants were labelled Tigil. The report from Tigil is therefore improbable and in need of confirmation.)

Noted in the following association:
In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 91, A. 92, A. 190); Sparse (A. 79, A. 191).

In South Kamtchatka *S. tetrapetala* is common along the southern part of the west coast northwards to the mouth of Opala R., where it suddenly disappears. Inland it is more rare. It occurs in the meadows, on the heaths and in wet meadow-like associations. It flowers at the end of July and in August. Specimens with one flower occur. *S. tetrapetala* is one of the few annual plants occurring in Kamtchatka.

Type of distribution: Asiatic Pacific.

Geographical area: from Ochotsk and S.W. Kamtchatka, southwards over Saghalin (acc. to FR. SCHM.), the Kuriles, Yezo and Ussuri to South-Ussuri.

645. ***Halenia corniculata*** (L.) DRUCE in Rep. Bot. Exch. Club Brit. Isl. III: 5, 1913 p. 419 (1914).

»*Swertia corollis quadrifidis quadricornibus . . .*» L., Amoen. Acad. II ed. 1 (1751) p. 344 (Pl. Rar. Kamtsch. p. 12). — *Swertia corniculata* L., Sp. pl. ed. I (1753) p. 227; PENNANT, Arct. Zool. (1784) p. CXV; PALLAS, Fl. Ross. I: 2 p.99; GEORGI, Beschreib. III: 4 p. 83. — »*Swertia corollis quadrifidis quadricornibus* LIN. Am. ac. 2 p. 3444» GMEL., Fl. Sib. IV p. 114. — *Halenia sibirica* BORKH. in ROEM., Archiv Bot. I (1796) p. 25; LEDEB., Fl. Ross. III p. 74; HERDER, Pl. Radd. Monopet. No. 139 in Acta Horti Petrop. I: 2 (1872) p. 468 et RADDE, Reisen IV: 1 p. 186; YABE & YENDO, Fl. Shimushu p. (192); KUDO Fl. Paramush. p. 151.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: S. of Kambolnaja RUBINSKI 1909; Kurile Lake noted by HN; »Oxernoj» (= Ozernaja) Hb. Sapporo; lower Ozernaja R. noted by HN; between Javina and Kochegochek noted in A. 92; S. of Kochegochek noted by HN; Sahach volcano noted in A. 191; upper Ksudach R. noted in A. 84; middle Ksudach R. Aug. 5th 1921 HN No. 2681 and 2688; Utashut

Island Rieder 1831; between the mouths of Golygina and Opāla rivers in meadow noted by Hn; the hot spring at Shadutka Aug. 12th 1922 Hn No. 4242; Lake Sterbot noted by Hn; upper Savan R. 250 m. July 31st 1921 Hn No. 2544; upper Opala R. near Assatcha noted in A. 184, A. 185; W. of Opala volcano 360 m. July 19th 1921 Hn No. 2209; the hot springs at upper Opala R. Aug. 4th 1922 Hn No. 4154; lower Bolshaja R. noted in A. 105, A. 107; middle Karymchina R. in meadow and *Angelica ursina*-meadow noted by Hn; between Bolsheredsk and Apatcha noted in A. 113; lower Bannaja R. noted in meadow and *Angelica ursina* meadow by Hn; the hot springs at Siku R. noted in A. 122; »Malaja Shreptik» Bannaja R. Komarov 1908; Paratunka Stubendorff 1849; between Nikolajevsk and Hutor Komarov 1908; Natchika Komarov 1908; Savoiko Komarov 1908, do. July 28th 1928 W. Eyerdam, do. Aug. 28th 1928 W. Eyerdam.

East Kamtchatka: Petropavlovsk Stewart, do. Perfiljef 1910, do. Komarov 1908, do. July 21st 1920 Hn No. 554, do. Aug. 6th 1920 Hn No. 768, do. Aug. 20th 1922 P. T. Novograblenof, do. Sept. 10th 1922 P. T. Novograblenof; between Petropavlovsk and Savoiko July 25th 1928 W. Eyerdam.

Central Kamtchatka: Milkova Bezais 1908 (Hb. Berol.), do. Komarov 1908.

West and North Kamtchatka: Utka Rubinski 1908; Tigil Levitzky (doubtful).

»Kamtchatka»: Steller acc. to Pallas loc. cit.; »Herb. Fischer Pallas», Merk, Langsdorff, Kegel, Kastalsky (sub *Swertia corniculata* Hb. Berol.), Mertens, Kittlitz, Peters 1831, Rieder.

Noted in the following associations;

In *Thalictrum—Sanguisorba—Carex* ass.:

Single (A. 84, A. 92, A. 105, A. 107, A. 184, A. 185, A. 191).

In *Angelica ursina—Filipendula—Thalictrum* ass.:

Single (A. 113, A. 122).

In South Kamtchatka *H. corniculata* occurs scattered here and there in the lowland-meadows. It flowers in the middle of July and in August. The plant is better known under the name *H. sibirica*, but that name cannot be retained as Linnaeus in Sp. pl. had already named it *Swertia corniculata*.

Type of distribution: Siberian.

Geographical area: Some isolated localities in central Perm prov., from Tomsk prov. eastwards in the north from about Krasnojarsk, Vitim-Olekma distr., Ajan, Saghalin and southern Kamtchatka, southwards to northern Mongolia, Shansi(!), Chili, Corea and Honshu. In China *H. elliptica* Don and throughout N. Amer. the closely related *H. deflexa* (Sm.) Griseb.

646. ***Menyanthes trifoliata*** L., Sp. pl. ed. 1 (1753) p. 145.

Mertens, Bemerk. Fl. Koragins p. 65; Herder, Pl. Radd. Monopet. No. 144 in Acta Horti Petrop. I: 2 (1872) p. 475 et Radde, Reisen IV: 1 p. 193; Miyabe, Fl. Kuril. p. 251; Kom., Voy. Kamtch. pp. 231, 452; Kudo, Fl. Paramush. p. 151.

Northern Kuriles: Paramushir T. MATSUBARA 1915, KUDO 1920.

South Kamtchatka: Lower Ozernaja R. noted by HN; Ozernaja RUBINSKI 1909; Kusingen R. near Sahach noted by HN; Golygina village noted by HN; the junction of Golygina and Ksudach rivers noted by HN; the mouth of Bolshaja R. July 4th 1921 HN No. 1947; the valley of »Malenki klutchik», Bannaja, 610 m. noted by HN; lower Bannaja R. noted by HN; Paratunka RIEDER, do. KOMAROV 1908 (Hb. Berol.); Lake Blishne June 16th 1921 HN No. 1748; in a small lake near Mt. Stoll noted by HN; Natchika STEWART (sub *Orchis*).

East Kamtchatka: Nalutcheva PERFILJEF 1910; Nishne Kamtchatsk 1925 MALAISE No. 521.

Central Kamtchatka: On the way to Korjatskaja volcano Aug. 11th 1928 W. EYERDAM; Kirganik KOMAROV 1909; Mashura KOMAROV 1909.

West and North Kamtchatka: Pallan SAVTCHENKO 1911; Karaginsk Island acc. to MERTENS loc. cit.

»Kamtchatka»: MERK acc. to HERDER loc. cit., KUSMISCHEFF, »Petropavlovsk MERTENS».

In South Kamtchatka *M. trifoliata* is not common owing to the scarcity of suitable localities. The small lakes and swamps are in fact often filled with volcanic ashes which have drifted into them.

Type of distribution: Circumpolar.

Geographical area: Europe: Nearly whole of Europe (except southernmost part) from Iceland and Kola penins. Asia: at Obi from about 67° N. lat., at Yenisei from about 69° N. lat., from Taimyr R., lower Lena and Kolyma rivers, southwards to N.E. Asia Minor, Transcaucasia, Kashmir, northern Mongolia, Corea and Honshu. America: from Alaska to Labrador and Newfoundland, southwards to California, Colorado, Iowa and Pennsylvania. W. Greenland (S. of Disco).

Convolvulaceae VENT.

Convolvulus persicus L.

PENNANT, Arct. Zool. (1784) p. CXIV. — »*Convolvulus pedunculis unifloris*» L., Amoen. Acad. II ed. 1 (1751) p. 341 (Pl. Rar. Kamtsch. p. 9).

Although this plant is enumerated and described by LINNAEUS in his dissertation on the Kamtchatka plants, he there remarks »Habitat ad litus maris Caspici».

The species should be excluded from the flora of our area.

Polemoniaceae JUSS.

Phlox sibirica L.

PENNANT, Arct. Zool. (1784) p. CXIV; LEDEB., Fl. Ross. III p. 82; HERDER, Pl. Radd. Monopet. No. 145 in Acta Horti Petrop. I: 2 (1872) p. 478 et RADDE, Reisen IV: 1 p. 196. —

»*Phlox foliis linearibus villosis, pedunculatis ternis*» L., Amoen. Acad. II ed. I (1751) p. 342 (Pl. Rar. Kamtsch. p. 9).

In Hb. Acad. Petrop., Hb. Hort. Petrop. and Hb. Berol. are preserved specimens of this species labelled »Kamtschatka REDOWSKY», »Ex Plantis REDOWSKIANIS» or the like. As REDOWSKY never visited our area they were probably collected about Ochotsk. HERDER reports — with a mark of interrogation — MERK as having collected the species in Kamtchatka. As *P. sibirica* occurs at Ochotsk and also north of our area it might well be expected to occur within its northern part, but the present records need confirmation.

647. ***Polemonium acutiflorum*** WILLD. ex. L., Syst. Veg. V, curant. ROEM. & SCHULT. (1819) p. 792.

Polemonium coeruleum ?PENNANT, Arct., Zool. (1784) p. CXV; MERTENS, Bemerk. Fl. Koragins p. 63; CHAM. in Linnaea VI (1831) p. 551; ERMAN, Verzeichn. p. 60; LEDEB., Fl. Ross. III p. 83; HERDER, Pl. Radd. Monopet. No. 146 in Acta Horti Petrop. I: 2 (1872) p. 483 et RADDE, Reisen IV: 1 p. 201 (β *gracile* seu *tenue*, γ *acutiflorum* seu *arcticum*); FEDTSCH., Fl. Îl. Comm. p. 93 (var. *grandiflorum*) saltem pro maxime parte; BRAND in ENGLER, Pflanzenr. IV: 250 (Heft 27) p. 37 (subsp. *villosum*). — *Polemonium villosum* KUDO, Fl. Paramush. p. 152. — *Polemonium chinense* BRAND in FEDDE, Rep. Spec. Nov. XVII (1921) p. 316 quoad pl. Kamtsch.

Northern Kuriles: Paramushir KUDO 1920.

South Kamtchatka: Upper Kidipalok R. Sept. 4th 1922 HN No. 4488; Assatcha mts. at the source of Opala R. July 31st 1922 HN No. 4094; Lake Kambolnoje Sept. 5th 1922 HN No. 4618 (A. 221); upper Udoshk R. S.W. of Opala 200 m. July 26th 1921 HN No. 2429; Opala R. 30 verst from the mouth RUBINSKI 1909; the hot spring at upper Karymchina R. 400 m. Sept. 10th 1921 HN No. 3091; Bolsheredsk BEZAIS 1909, do. July 8th 1921 HN No. 2042; Apatcha KOMAROV 1908; Paratunka KOMAROV 1908; Nikolajevsk KOMAROV 1908; Natchika STEWART; Poperochnaja R. KOMAROV 1909; Topolovaja R. KOMAROV 1909; Savoiko July 4th and 27th 1928 MALAISE, do. July 25th, 26th and 31st 1928 W. EYERDAM; Korjaka RUBINSKI 1908.

East Kamtchatka: Petropavlovsk July 21st 1920 HN No. 555; Cape Kozlov June 1923 MALAISE; »am Fusse der Kamtschat. Sopka häufig» (= the foot of Klutchevskaja volcano) RIEDER acc. to HERDER loc. cit., do. KURTASHOF 1909; Lake Assabatch Aug. 15th 1925 MALAISE No. 522; Shivelutch KOZLOVSKY 1910.

Commander Islands: Bering Island KJELLMAN, DYBOVSKY 1879, GREBNITZKY 1894 and acc. to FEDTSCH. loc. cit. STEJNEGER, acc. to MIYABE & KUDO loc. cit. N. HASHIMOTO 1907; Copper Island, DYBOVSKY 1879, acc. to FEDTSCH. loc. cit. STEJNEGER, TILMAN 1900 and MOROZEWICZ 1903; GUDZENKO 1910.

Central Kamtchatka: The foot of Korjatskaja volcano KOMAROV 1908; Ganala KOMAROV 1909; Kirganik KOMAROV 1909, Mashura KOMAROV 1909;

Shtchapina KOMAROV 1909; between Shtchapina and Tolbatchik BEZAIS 1908; Tolbatchik BEZAIS 1908, do. KOMAROV 1909; Anauna R. Aug. 19th 1926 MALAISE No. 385, do. Sept. 5th 1926 MALAISE No. 386; Kresti July 5th 1921 HN No. 3414 (MALAISE).

West and North Kamtchatka: Kompakovaja ZELENIN 1908; Tigil LEVITZKY 1848; Pallan SAVTCHENKO 1911; Karaginsk Island MERTENS, do. POSTELS, do. LOGINOVSKI.

In South Kamtchatka *P. acutiflorum* occurs here and there. It seems to be more rare towards the south.

Our plant was often confused with *P. coeruleum*, from which it differs in its campanulate corolla with ciliate fairly acute lobes, and in denser and longer hairs. As it occupies a distinct geographical area, I think it should be regarded as a separate species. The name *P. villosum* RUD. (in GEORGI, Beschreib. III: 4 (1800) p. 771) cannot be used, as no diagnosis is given there, but merely a quotation of a synonym from GMELIN, which seems to refer to *P. coeruleum*. (Comp. LEDEB. in Denkschr. Bot. Ges. Regensb. III (1841) p. 122). Acc. to BRAND (loc. cit. p. 39) one of the three specimens in Hb. WILLD. labelled *H. acutiflorum* is »*P. lanatum*» and only the other two are our species. As, however, it is clearly seen from the diagnosis loc. cit. (»*petalis acutis margine subciliatis*») that the plant now in question is meant, and not »*P. lanatum*», the above must be the correct name for the plant. Later (Bot. Not. 1858, p. 190) it was described by FRIES as *P. coeruleum* subsp. *campanulatum*.

In FEDDE, Rep. Spec. Nov. XXIII (1927) p. 274 TOLMATCHEW described a new *Polemonium*, *P. majus*, from Copper Island, based on specimens in Hb. Acad. Petrop. labelled »From the Governor 1887». He takes it for »eine eigentümliche Lokalrasse von *P. lanatum*». The lobes of the large corolla are distinctly acute and — what is not stated in the diagnosis — sparsely but clearly ciliated. These important characteristics identify it with *P. acutiflorum*, which also has the lower part of the stem glabrous and the petioles of the lower leaves strongly delatate, quite like the specimen of *P. majus* from Copper Island. It agrees fairly well with specimens of *P. acutiflorum* collected by KJELLMAN at St. Lawrence Bay and St. Lawrence Island. It is, as far as I can see, a luxuriant specimen of the arctic form of *P. acutiflorum*.

Type of distribution: Eurasiatic—Western American.

Geographical area: Europe: Northern Scandinavia (not known from Kola Penins.), Kanin penins., Kolgujef and Nova Zembla, southwards to about the Arctic Circle. Asia: Arctic Siberia, Kamtchatka, the northern Kuriles, central Saghalin (a small area between Manka and Vladimirovka acc. to MIYABE & KUDO loc. cit.). America: at least Alaska (Port Clarence, Kadiak Island).

648. ***Polemonium humile*** WILLD. ex ROEM. & SCHULT., Syst. Veg. IV (1819) p. 792, *sensu stricto*, non auctor. cet.

HOOK. & ARNOTT in Beechy's Voy. p. 116; CHAM. & SCHLECHT. in Linnaea VI (1831) p. 552; YABE & YENDO, Fl. Shimushu p. (192): MIYABE & KUDO in

Transact. Sapporo Nat. Hist. Soc. IV: 2 (1913) p. 102 quoad pl. ex Kamtsch. et Ins. Shumshu. — ?*Polemonium pulcherrimum* Hook. in Curtis' Bot. Mag. 57 N. Sér. IV (1830) tab. 2979 quoad pl. Kamtsch.; *Polemonium pulchellum* β *humile* Ledeb., Fl. Ross. III p. 84. — »*Polemonium*» Kittlitz, Denkw. II p. 222. — *Polemonium lanatum* subsp. *boreale* Brand in Engler, Pflanzenr. IV: 250 (Heft 27) p, 40 quoad pl. Kamtsch. — *Polemonium lanatum* Kom., Voy. Kamtch. p. 454. — *Polemonium coeruleum* ε *humile* Herder, Pl. Radd. Monopet. No. 146 in Acta Hort. Petrop. I: 2 (1872) p. 484 et Radde, Reisen IV: 1 p. 202 quoad pl. Kamtsch.

Northern Kuriles: Shumshu acc. to Yabe & Yendo and Miyabe and Kudo loc. cit.

South Kamtchatka: Rukavichkin Bay Rieder 1831; Toporkoff Island Aug. 8th 1920 Hn No. 790; Bogatyrjovka July 16th 1920 Hn No. 473.

East Kamtchatka: The entrance to Avatcha Bay Perfiljef 1911; Rakovaja Bay Savitch 1909; Avatcha volcano 2000 feet Perfiljef 1911, do. 675 m. July 30th 1920 Hn No. 607, do. 1300 m. noted by Hn; Cape Kozlof June 1923 Malaise; the foot of Klutchevskaja volcano Kurtashof 1909.

Central Kamtchatka: the foot of Korjatskaja volcano Komarov 1908; Korjatskaja volcano Aug. 13th and 14th 1928 W. Eyerdam; Ganala Stewart, do. Komarov 1909; Kamtchatka vershina Grinop 1909; Pushtchina Komarov 1909 (Hb. Holm.); Tolbatchik Bezais 1908; between Kosyrevsk and Ushki Protopopof 1909; Kresti July 5th 1921 Hn No. 3413 (Malaise).

West and North Kamtchatka: Tigil Levitzky 1848; Pallan Levitzky 1848; Karaginsk Island Mertens and acc. to Herder loc. cit. Postels.

»Kamtchatka»: Chamisso, Eschscholtz, Choris, Stewart, Kastalsky, Kusmischeff, Mertens, Peters 1831, Littledale 1900 acc. to Miyabe & Kudo loc. cit.

P. humile was only seen on the N.E. border of South Kamtchatka. It seems to be more common to the north, especially along the coast.

Our plant agrees completely with the type specimen of *P. humile* in Hb. Willd. (No. 3770) which is a low-grown specimen (very similar to that figured in pl. 4 fig. c), acc. to the label collected »In Sibiriae orientalis maritimis arenosis». From the arctic plant (*P. lanatum* subsp. *boreale*), often called *P. humile*, it differs in having on an average smaller flowers (8—14 mm.) more branched stem with several stem-leaves, more open inflorescence and long slender pedicels. (Compare pl. 4 fig. c, d.) It seems to me hardly possible to identify it with *P. lanatum*. It resembles far more closely the N. American *P. pulcherrimum* Hook.

P. pulchellum from Altai, *P. parviflorum* Tolmatchew from Kolyma (Not. Syst. Hort. Bot. Petrop. IV (1923) p. 48), *P. humile* from Easternmost Asia and *P. pulcherrimum* from W. America, form a group which throughout differs from *P. lanatum* practically in the same characteristics as our plant, and more material than I have had access to is necessary to admit of a critical comparison between them. They can hardly all be maintained as separate species.

Type of distribution: ? Northern Pacific.

Geographical area: Known with certainty only from our area. In Kolyma the doubtfully distinct *P. parviflorum* TOLM. and in W. America the closely related *P. pulcherrimum* HOOK.

»**Polemonium humile macranthum**» CHAM. & SCHLECHT. in Linnaea VI (1831) p. 552.

In Hb. Acad. Petrop. there is a specimen of this plant labelled »Petropavlovsk MERTENS», and another labelled »Kamtchatka» only. This plant is otherwise known to occur on St. Paul's Island. As MERTENS' plants have proved in several other cases to be unreliably labelled, the report must be confirmed. The plant might well be expected somewhere on the shores of north Kamtchatka or in the Commander Islands.

Hydrophyllaceae LINDL.

Romanzoffia unalaschcensis CHAM.

In his manuscript of a Kamtchatka flora MAXIMOWICZ reports this plant as collected by DYBOVSKY on Copper Island. I have not been able to find the specimen on which the report was founded. Although the plant might well be expected there, and no objection to the report can be raised, I think that it would be better to await confirmation before the species can be regarded as a member of the flora of our area.

Borraginaceae LINDL.

649. ***Lappula deflexa*** (WAHLENB.) GARCKE, Fl. Nord. u. Mitt. Deutschl. ed. VI (1863) p. 275.

[*Myosotis deflexa* WAHLENB., in Vet. Acad. Handl., Stockholm 31 (1810) p. 113 f. 4]. — *Echinospermum deflexum* LEHM., HERDER, Pl. Radd. Monopet. No. 187 in Acta Horti Petrop. I: 2 (1872) p. 547 et RADDE, Reisen IV: 1 p. 265.

Central Kamtchatka: Milkova KOMAROV 1909.

West and North Kamtchatka: Tigil RIEDER, do. BEZAIS.

The species is probably not indigenous within our area.

Type of distribution: Eurasiatic, transgressing into W. America.

Geographical area: From Scandinavia and Dauphiné eastwards (in Europe several isolated areas) throughout Siberia at Obi and Yenisei from about the Arctic Circle, from Vilju distr. Ochotsk and north Kamtchatka, southwards to Semiretchensk prov., northern Mongolia and Corea. (Introduced into E. America.) In W. America the var. *americana*, sometimes taken as a separate species; from British Columbia to Manitoba southwards to Iowa and Idaho.

650. ***Lappula echinata*** GILIB., Fl. Lithuan. I (1781) p. 25.

Echinospermum Lappula L., HERDER, Pl. Radd. Monopet. No. 188 in Acta Horti Petrop. I: 2 (1872) p. 549 et RADDE, Reisen IV: 1 p. 267.

Central Kamtchatka: Milkova RIEDER, do. BEZAIS (sub *Echinospermum anisacanthum*).

»Kamtchatka»: »Petropavlovsk MERTENS».

The species has probably been introduced into our area. A type specimen of *L. anisacantha* (to which species KOMAROV refers the Eastern Asiatic plant of this type), which I have seen in Hb. TURCZ., had nutlets with the second row of prickles only slightly developed, visible only at the base of the nutlet. In the well-developed row long and short prickles alternated, at least in some of the nutlets. It seems to me that the form in question lies within the latitude of variation of *L. echinata*, but I have not gone through any very large Eastern Asiatic material. KRYLOF takes it to be a variety of *E. Lappula*. The Kamtchatka specimens, however, do not, as far as I can see, differ in any important respect from the Scandinavian.

Type of distribution: Eurasiatic.

Geographical area: Europe, except northern and western parts; throughout Siberia at Yenisei from about 62° N. lat., southwards to Persia and northern China. Naturalized in E. and W. America.

Eritrichium aretioides (CHAM. & SCHLECHT.) DC., Prodr. 10 (1846) p. 125.

LEDEB., Fl. Ross. III p. 149. — *Myosotis aretioides* CHAM. & SCHLECHT. in Linnaea IV (1829) p. 443; MERTENS, Bemerk. Fl. Koragins pp. 62, 71. — *Eritrichium Chamissonis* DC., Prodr. 10 p. 125 saltem quoad pl. Kamtsch.; LEDEB., Fl. Ross. III p. 149, saltem quoad pl. Kamtsch. — *Eritrichium nanum* γ *aretioides* HERDER, Pl. Radd. Monopet. No. 177 in Acta Horti Petrop. I: 2 (1872) p. 535 et RADDE, Reisen IV: 1 p. 252.

West and North Kamtchatka: Karaginsk Island acc. to MERTENS loc. cit.

»Kamtchatka»: Collector unknown »Kamtschatka Herb. LEDEB.», »Petropavlovsk Dr. MERTENS» (these may be the specimens from Karaginsk Island which MERTENS reports, but as he collected very similar specimens at »Fretum Senjavin» they may equally well be incorrectly labelled specimens from that locality).

As there are no specimens that beyond doubt originate from our area, the report needs confirmation. MERTENS' report cannot be considered as certain, as *E. villosum* has sometimes been mistaken for *E. aretioides*. *E. aretioides* is an arctic plant from the American and Siberian coast of the Bering Sea (extending westwards at least as far as to Yenisei), and might well be expected in the northern part of our area.

651. ***Eritrichium pectinatum*** (PALL.) DC., Prodr. 10 (1846) p. 127.

LEDEB., Fl. Ross. III p. 152; HERDER, Pl. Radd. Monopet. No. 179 in Acta Horti Petrop. I: 2 (1872) p. 538 et RADDE, Reisen IV: 1 p. 256. — *Myosotis pectinata* PALLAS, Reise versch. Prov. Russ. Reich. III (1776) Anhang p. 717 tab. E fig. 4; LEHM., Pl. Fam. Asperifol. p. 105. — *Eritrichium sericeum* LEDEB., Fl.

Ross. III p. 151 saltem quoad pl. Kamtsch. — *Eritrichium rupestre* β *pauciflorum* s. *sericeum* HERDER, Pl. Radd. Monopet. No. 180 in Acta Horti Petrop. I: 2 (1872) p. 540 et RADDE, Reisen IV: 1 p. 258.

South Kamtchatka: Mt. »Krasni gor», Lake Natchika KOMAROV 1908; the sources of Poperochnaja R. KOMAROV 1908.

East Kamtchatka: Avatcha volcano, the »dry river» PERFILJEF 1909, do. 900 m. July 30th 1920 HN No. 577 a and b; Korjatskaja volcano Aug. 14th 1928 W. EYERDAM.

»Kamtchatka»: ESCHSCHOLTZ »Herb. LEDEB. *Myosotis sericea* LEHM.?»

In Kamtchatka *E. pectinatum* seems to be confined to a small area W. and N. of Avatcha Bay. It flowers in July.

Kamtchatka specimens are typical and were already mentioned by PALLAS in the original diagnoses. In Central Asia closely related forms occur (*E. rupestre* (PALL.) BUNGE) which, acc. to PRINTZ (Veg. Sib. Mong. Front. p. 366), cannot be specifically distinguished from our plant. They differ strongly, however, in having on dry specimens narrow, involute leaves and nutlets with a narrow margin, or sometimes practically without one but always without teeth on the border. They must at least be regarded as a race of *E. pectinatum*. They are included in the area given below, as it is impossible for the present to give the areas separately.

Type of distribution: Siberian.

Geographical area: from northern Perm prov. (one locality about 59° N. lat. acc. to KORSHINSKY) eastwards, in the north to Tomsk prov. Verchojansk, Jakutsk and Ochotsk districts, in the south to Tibet, Mongolia and northern China, also in Kamtchatka. (Not known from Japan or Saghalin).

652. ***Eritrichium villosum*** (LEDEB.) BUNGE, Verz. im Östl. Theile Altai. ges. Pfl. (Suppl. Fl. Altaica) in Mem. Ac. Imp. Sc. St. Petersb. par div. sav. II (1835) p. 531 (in the reprint p. 9).

LEDEB., Fl. Ross. III p. 150, HERDER, Pl. Radd. Monopet. No. 178 in Acta Horti Petrop. I: 2 (1872) p. 536 et RADDE, Reisen IV: 1 p. 254. — [*Myosotis villosa* LEDEB. in Mém. Ac. Imp. Sc. St. Petersb. V (1812) p. 516]. — ?»*Eritrichium Chamissonis* DC?» YABE & YENDO, Fl. Shimushu p. (193).

Northern Kuriles: ?Shumshu YENDO 1903 acc. to YABE & YENDO loc. cit.

South Kamtchatka: Mt. Zaikin Mys, Paratunka KOMAROV 1908; mt. Trubi Paratunka KOMAROV 1908; mt. Taburett, Natchika RUBINSKI 1909; Poperochnaja R. KOMAROV 1908; mt. Palovinaja, Savoiko 700 m., July 8th 1920 HN No. 296 a, do. 800 m. July 8th 1920 HN No. 349, do. July 14th 1928 W. EYERDAM, do. July 22nd 1928 MALAISE.

East Kamtchatka: The Kronoki Pass KOMAROV 1909; the Chartchina mts. Aug. 12th 1927 MALAISE.

Central Kamtchatka: Ganala PROTOPOPOF 1908 (f. flor. albis); the sources of Kashkan R. KOMAROV 1909; upper right Shtchapina R. at the pass KOMAROV 1909; Anauna R. Aug. 18th 1926 MALAISE No. 380, do. Sept. 5th 1926 MALAISE No. 381, do. Sept. 9th 1926 MALAISE No. 382; the pass between Anauna R. and Kech-heren R. Sept. 6th 1926 MALAISE No. 389; Klutchi June 12th 1921 HN No. 3329 (MALAISE).

West and North Kamtchatka: »Krasnaja Sopka» between Sedanka and Jelovka BEZAIS 1909.

»Kamtchatka»: ESCHSCHOLTZ and KASTALSKY acc. to HERDER loc. cit., KUSMISCHEFF, »Petropavlovsk MERTENS», »auf d. Kamtschatischen Gebirgskette» RIEDER 1833.

In South Kamtchatka this beautiful plant was only seen on the N. E. border of the district. It flowers at the end of June and the beginning of July.

Specimens from the northern part of the peninsula such as those from Anauna R. closely agree as to their habitus with the low-grown arctic form of our plant, while those from South Kamtchatka are more gracile with higher stem. No Kamtchatka specimens that I have seen had tuberculate bases on the hairs of the leaves, as is sometimes the case in arctic specimens.

Type of distribution: Eurasiatic.

Geographical area: Europe: One locality in Scandinavia (about 70° N. lat., Tsipnavalok on Ribachi Penins.), Kanin, Kolgujef, Nova Zembla, Vaigatch and the Urals southwards to about 62° N. lat. Asia: along the North Coast to Chukch Penins., southwards in the mts. to Altai, Transbaikalia, Jakutsk distr. and Kamtchatka, also reported from Fergana, Tianshan and other central Asiatic mts. as well as from Caucasus. In the mts. of Central Europe the closely related *E. nanum* (ALL.) SCHRAD.

653. ***Plagiobotrys orientalis*** (L.) JOHNSTON in Contr. Gray. Herb. LXXXI (1928) p. 80.

[*Heliotropium orientale* L., Sp. pl. ed. I (1753) p. 131]. — *Lithospermum plebejum* CHAM. & SCHLECHT. in Linnaea IV (1829) p. 446. — *Eritrichium plebejum* α *tenue* s. *Chorisianum* HERDER, Pl. Radd. Monopet. No. 182 in Acta Horti Petrop. I: 2 (1872) p. 542 et RADDE, Reisen IV: 1 p. 260 quoad pl. Kamtsch. — *Krynitzkia plebeja* A. GRAY in Proceed. Amer. Acad. XX (1885) p. 266. — *Allocarya plebeja* GREENE in Pittonia I (1887—89) p. 16 quoad pl. ex insulis Aleut. — *Allocarya asiatica* KOMAROV in FEDDE, Rep. Spec. Nov. 13 (1914) p. 236 et Fl. Penins. Kamtsch. I p. 39. — *Plagiobotrys plebejus* JOHNST. in Contr. Gray Herb. LXVIII (1923) p. 77. — *Plagiobotrys asiaticus* JOHNST. in Contr. Gray Herb. LXXIII (1924) p. 68.

South Kamtchatka: »Lopatka RIEDER» (as South Kamtchatka was formerly sometimes called »Lopatka», it may be uncertain whether the plant was actually collected on Cape Lopatka); the mouth of Javina R. noted by HN; Javina village noted by HN; Golygina village Aug. 8th 1921 HN No. 2762; Lake Kambolnoje Sept. 14th 1922 HN No. 4581; Bolsheredsk, islands

in Bystraja R. Aug. 19th 1908 KOMAROV (Hb. Kew acc. to JOHNSTON loc. cit.); Bolsheredsk RUBINSKI 1908, do. BEZAIS 1909, do. July 8th 1921 HN No. 2036 and 2068.

Commander Islands: Bering Island acc. to STELLER manuscr. (Compare below).

Central Kamtchatka: Sharomsk RIEDER.

»Kamtchatka»: STELLER acc. to JOHNST. loc. cit. (the specimens may be from Bolsheredsk, where STELLER lived for a long time and where the plant is common, or from Bering Island; compare below), »herb. PALLAS» acc. to HERDER loc. cit., »Herb. FISCH.» (Hb. Hort. Petrop.), RIEDER 1831, »*Myosotis* Kamtschatka leg. RIEDER 1835 MEINSH.».

This plant was seen only at the above enumerated places. In wet places in the village of Bolsheredsk it is common. It was never observed in places far from human habitation. It flowers from July to September. *P. orientalis* is a comparatively variable plant. Specimens growing in dry places usually have broader leaves and thick and short stems, while those that have a wetter habitat are more slender and long, with narrow leaves. My material was kindly controlled by Dr. JOHNSTON.

Dr. JOHNSTON found our plant in the Linnaean herbarium in London under the name *Heliotropium orientale.* The Linnaean specimen was lacking in further data but was marked with a cabalistic symbol (♃), which acc. to JACKSON is to be found on the plants collected by STELLER in Kamtchatka (Compare JACKSON, Index Linn. Herb. p. 19).[1] A specimen in the Linnaean herbarium in Stockholm originally labelled »*Heliotropium an curassavicum*» »with »*an curassavicum*» crossed out) was published by LINDMAN (Sv. Vet. Ak. Ark. f. Bot. 9 No. 6 (1909) p. 3) as »*Heliotropium orientale* L. sp. pl. 131, 5(?)». It is quite a different plant and nothing in its original label indicates that it is the type of *H. orientale.*

It may be noted that in the description of *H. orientale* in Sp. pl. its leaves are stated to be glabrous; our plant has, however, stiff white hairs as well in the margin as on both sides of the leaves.

The first report of this plant was undoubtedly made by STELLER, who in his manuscript »Descript. Pl. rar. ins. Beringi 1742 observ . . .» reports it as No. 20 »*Lithospermum repens*», which can hardly be anything but our plant, as otherwise no *Borragine* except *Mertensia maritima*, which STELLER called *Pulmonaria maritima*, is known from Bering Island. Compare FEDTSCH. Fl. Îl. Comm. p. 20.

Type of distribution: Northern Pacific.

Geographical area: Known from South Kamtchatka, Commander Islands and the Aleutian Islands.

Borago officinalis L.

East Kamtchatka: Petropavlovsk at »the Farm» Oct. 15th 1920 HN. No. 1477.

[1] Compare this paper p. 236.

Probably cultivated at the experimental farm and occasionally escaped from cultivation.

A native of S. W. Europe and N. Africa.

Lycopsis arvensis L., Sp. pl. ed. I (1753) p. 139.

East Kamtchatka: Petropavlovsk at the farm Oct. 15th 1920 Hn No. 1475.

This plant was found near the experimental farm at Petropavlovsk and may have come to Kamtchatka with seed.

The specimen belongs to subsp. *occidentalis* Kuznets. Trav. Mus. Bot. Ac. Imp. Sc. St. Petersb. VIII (1911) p. 96.

L. arvensis is a native of Europe and S. W. Asia. A map of the distribution is given by Kuznets. loc. cit. tab. 3. It occurs adventive in N. and S. America, but was not found in the Siberian herbarium at Petrop.

654. ***Myosotis alpestris*** F. W. Schmidt in Fl. Boëm. T. I centur. III (1794) p. 26.

subsp. ***asiatica*** Vesterg. n. ssp.[1]

A typo differt caulibus elongatis, foliis caulinis elongatis, angustatis, saepe linearibus vel sublinearibus, magis conformibus, foliis etiam basalibus angustioribus.

Myosotis silvatica β *alpestris* Ledeb., Fl. Ross. III p. 145 pro parte; Herder, Pl. Radd. Monopet. No. 184 in Acta Horti Petrop. I: 2 (1872) p. 544 et Radde, Reisen IV: 1 p. 247 pro parte. — (*M. suaveolens* H. Lindb. in Meddel. Soc. pro Fauna et Fl. Fennica 26 (1900) p. 50, non Waldst. & Kit.). — *Myosotis silvatica* Kom., Voy. Kamtch. p. 453. — *Myosotis caespitosa* Malaise, Jakter och Jordbävn. p. 101. (fig.).

South Kamtchatka: Shadutka Rieder 1831; Tikhirka Bay Rieder 1831; the hot springs at Siku Rubinski 1909; Lake Dalni Komarov 1908; Toporkoff Island Aug. 8th 1920 Hn No. 794, do. June 24th 1921 Hn No. 3624 (P. T. Novograblenof); Korjaka Komarov 1908; the Korjaka valley Rubinski 1908.

East Kamtchatka: Cape Kozlof June 20th—30th 1923 Malaise cfr. Malaise loc. cit. The foot of Klutchevskaja volcano Kurtashof 1909; between Kamaki and Nishne Kamtchatsk July 2nd 1925 Malaise No. 523, do. Malaise No. 524 (f. flor. albis).

Central Kamtchatka: Malka Komarov 1909; Ganala Grinop 1909, do. Komarov 1909 (Hb. Holm.); the Ganala tundra Komarov 1909; Klutchi Bezais 1908, do. Afanasejev 1909, do. June 5th 1921 Hn No. 3319.

West and North Kamtchatka: Tigil Bezais; Pallan Savtchenko 1911, do. 6 verst to the S. W. Savtchenko 1911; Karaginsk Island Mertens.

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[1] Communicated by T. Vestergren.

»Kamtchatka»: Wormskiold (Hb. Mertens), Stewart, Levitzky 1840, Peters 1831, Rieder 1833.

In South Kamtchatka *M. alpestris* subsp. *asiatica* was only observed on the N. E. border of the district. It seems to be more common northwards. It flowers from the middle of June to the end of July.

Type of distribution: Eurasiatic—Western American.

Geographical area: The head form in Scotland, the Alps and the Carpathians. Subsp. *asiatica*: from Solovetski Island and E. Kola Penins. eastwards along the coast to Chukch Penins., southwards in the mts. at least to Caucasus, Songaria, Mongolia, Shilka R. (Acc. to Maxim. in Mél. Biol. VII (1872) p. 545), Ajan and Kamtchatka. America: from the north coast of Alaska eastwards at least to the mouth of Mackenzie R. and Alberta, southwards to Colorado. In Europe, several closely related species.

655. ***Myosotis laxa*** Lehm., Pl. fam. Asperifol. (1818) p. 83.

Myosotis caespitosa Sch., Herder, Pl. Radd. Monopet. No. 173 in Acta Horti Petrop. I: 2 (1872) p. 522 et Radde, Reisen IV: 1 p. 240. — *Eritrichium radicans* Herder, Pl. Radd. Monopet. No. 184 in Acta Horti Petrop. I: 2 (1872) p. 544 et Radde, Reisen IV: 1 p. 262 quoad pl. Kamtsch. sec. Maxim., Manuscr. — *Myosotis palustris* Kom., Voy. Kamtch. p. 453.

South Kamtchatka: The hot spring at upper Unkanakchek R. Aug. 19th 1922 Hn. No. 4310 (on hot gravel); »Golygina hot spring» Rubinski 1909; Golygina village Aug. 8th 1921 Hn No. 2758; the hot spring at upper Karymchina R. 400 m. Sept. 10th 1921 Hn No. 3083; 10 km. W. of Bolsheredsk Aug. 26th 1921 Hn No. 2960; Bolsheredsk Komarov 1908, do. July 8th 1921 Hn Nos. 2023 and 2059; Apatcha Komarov 1908; the hot spring at upper Bannaja R. Sept. 12th 1921 Hn No. 3227; the hot spring »Malenki Klutchik» Bannaja 375 m. Sept. 12th 1921 Hn No. 3157; Lake Dalni Komarov 1908; »Malochni klutch» R., Paratunka Komarov 1908; Nikolajevsk Komarov 1908, do. Aug. 11th 1920 Hn No. 850; between Nikolajevsk and Hutor Komarov 1908; Hutor July 20th 1928 W. Eyerdam; the shore of Natchika R. Rubinski 1909; Palovinaja R. Savoiko Komarov 1908; Savoiko July 5th, 27th and 28th 1928 W. Eyerdam.

Central Kamtchatka: Malka Stubendorff 1849, do. Komarov 1909; Milkova Bezais 1908; Mashura Komarov 1909; Kresti July 5th 1921 Hn No. 3415 (Malaise).

»Kamtchatka»: Kastalsky and Kusmischeff (Hb. Fisch., *M. caespitosa* teste Maxim., probably the specimens reported by Herder loc. cit. as *Eritrichium radicans*), Rieder.

In South Kamtchatka *M. laxa* was not observed within the area rarely visited by man. It occurs chiefly in the neighbourhood of the villages and at the hot springs and it is possibly not indigenous within our area.

Type of distribution: Eurasiatic, transgressing into E. and W. America.

Geographical area: Europe from northernmost Scandinavia, Kola penins. and northern Russia, southwards to Spain, Italy and Caucasus. Asia: W. Asia from southern Tobolsk prov. and Tomsk prov. southwards and westwards to Asia Minor and Western Himalaya, also (indigenous?) in southern Yeniseisk prov., Irkutsk prov., Dahuria, Amur prov., Jakutsk prov. and Kamtchatka. E. America from Newfoundland and Ontario, southwards to N. Carolina and Tennessee. W. America: British Columbia, Washington, Oregon. N. Africa.

Mertensia denticulata DON.

LEDEB., Fl. Ross. III p. 133. — *Pulmonaria denticulata* CHAM. in Linnaea IV (1829) p. 448; DC., Prodr. X p. 90. — *Mertensia sibirica* HERDER, Pl. Radd. Monopet. No. 163 in Acta Horti Petrop. I: 2 (1872) p. 510 et RADDE, Reisen IV: 1 p. 228.

The sources of the above reports of *M. denticulata* from Kamtchatka are specimens in Hb. Acad. Petrop. and Hb. Berol. collected by REDOWSKY in »Kamtchatka». As REDOWSKY never visited Kamtchatka peninsula the species should be excluded from the flora of our area. The specimen in Berlin is properly labelled »Sib. max. oriental.». HERDER loc. cit. gives the report as »aus Kamtschatka REDOWSKY und ESCHSCHOLTZ» but this is doubtless merely an incomplete quotation of LEDEBOUR's report, which reads »REDOWSKY ex CHAMISSO et ESCHSCHOLTZ».

656. ***Mertensia kamtschatica*** (TURCZ.) DC., Prodr. X (1846) p. 91 *(Kamczatica).*

LEDEB., Fl. Ross. III p. 136; HERDER, Pl. Radd. Monopet. No. 165 in Acta Horti Petrop. I: 2 (1872) p. 512 et RADDE, Reisen IV: 1 p. 230 quoad pl. Kamtsch. — ?*Pulmonaria pumila* SCHRANK in Nova Acta Phys. Med. Leopold.-Carol. Nat. Curios. IX (1818) p. 101; cfr. CHAM. in Linnaea 4 (1829) p. 450; cfr: LEDEB., Fl. Ross. III p. 136. — ?*Lithospermum Schreberianum* L., Syst. Veg. curant. SPRENGEL I (1825) p. 546; ?DC., Prodr. X pp. 83, 91. — *Lithospermum Kamczaticum* TURCZ. in Bull. Soc. Nat. Mosc. 13 (1840) p. 75. — *Stenhammera Kamczatica* TURCZ. loc. cit. p. 250. — *Lithospermum denticulatum* HOOK. & ARNOTT. in Beechy's Voy. p. 116; LEDEB., Fl. Ross. III p. 133 quoad pl. Kamtsch. pro parte. — *Mertensia elliptica* LEDEB., Fl. Ross. III p. 135.[1] — *Mertensia longistyla* LEDEB., Fl. Ross. III p. 135. — »vielleicht *Pulmonaria maritima*» KITTLITZ, Denkw. II p. 257. — *Mertensia paniculata* YABE & YENDO Fl. Shimushu p. (193); KUDO, Fl. Paramush. p. 153 (var. *pubescens*).

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka Sept. 1847 VOSSNESENSKY; Illina volcano 500 m. noted by HN; upper Kidipalok R. Sept. 4th 1922 HN No. 4469; Mt. Dogshinag RUBINSKI 1909; Assatcha mts. at the source of Opala R. July 31st 1922 HN No. 4081; Akhomten Bay Sept. 18th 1920 HN No. 1414 (var. *scabra*), do. sept. 22nd 1920 HN No. 1452 (var. *scabra*); Lake Tol-

[1] This species does not belong to *M. rivularis* as proposed by REGEL & TILING in Fl. Ajan p. 113. It has the characteristic nutlets of *M. kamtschatica.*

machovaja noted by HN; the hot springs at Karymchina R. 490 m. Sept. 10th 1921 HN No. 3082; the Kohelok R. noted by HN; upper Bannaja R. noted by HN; Lake Natchika KOMAROV 1908 (sub *M. pilosa*), do. RUBINSKI 1908; Nikolajevsk KOMAROV 1908 (var. *scabra*); Savoiko June 14th 1928 MALAISE; Mt. Palovinaja June 22nd 1928 MALAISE, do. Aug. 1st 1928 W. EYERDAM; Korjaka KOMAROV 1909 (sub *M. pilosa*, Hb. Holm.), do. July 9th 1921 HN No. 3629 (P. T. NOVOGRABLENOF).

East Kamtchatka: The Penishiva Pass July 28th 1928 W. EYERDAM; the Kronoki Pass KOMAROV 1909 (sub *M. pilosa*); Klutchevskaja volcano BEZAIS 1908 (Hb. Holm.). do. AFANASEJEF 1909 (sub *M. paniculata*); »pervaja na dolu sopotchka» PROTOPOPOF 1909 (sub *M. paniculata*); Ustj-Kamtchatsk July 30th 1925 MALAISE Nos. 526 and 527, do. Aug. 10th 1925 MALAISE No. 525.

Central Kamtchatka: Gremushej R. KOMAROV 1908 (sub *M. pilosa*); »Ganalski Vaktal» R. PROTOPOPOF 1908 (sub *M. paniculata*); the right Shtchapina R. KOMAROV 1909 (sub *M. pilosa*); Klutchi DYBOVSKY (sub *M. elliptica*).

West and North Kamtchatka: Between Sedanka and Jelovka BEZAIS 1909; Tigil Hb. TURCZ. *Lithospermum kamczaticum* m., *Stenhammera kamczatica* m. (Hb. TURCZ., type of the species); Karaginsk Island MERTENS (sub *Mertensia longistyla* Herb. LEDEB.).

»Kamtchatka»: ESCHSCHOLTZ (*M. elliptica* Hb. LEDEB.); KEGEL, LUBARSKY, STEWART and KUSMISCHEFF (all acc. to HERDER loc. cit.); »Petropavlovsk MERTENS», PETERS 1831.

In South Kamtchatka *M. kamtschatica* occurs here and there in the lower alpine region and sometimes also in the lowlands (swept down by the rivers?). It flowers in July and August and has ripe fruits at the end of September.

Our plant has often been confused with other *Mertensia* species, and also redescribed several times as a supposed new species. This is evidently due to the fact that characteristics were taken to be essential that are of minor systematic importance, or even such as change during the development of the plant. The mutual length of the corolla and the calyx, the length of the style, and in certain respects also the hairiness, are such characteristics. Upon studying a large material of our plant it is easily observed that the length of the corolla increases considerably during the anthesis and that the calyx also increases very strikingly, especially after floration. The difference in the length of the style in different specimens is not a characteristic that can be used in taxonomy for distinguishing different species, as the style apparently grows very considerably during floration. Furthermore, the possibility that the species is heterostyle must be taken into consideration. The hairiness is usually comparatively characteristic for the different *Mertensia* species, but it seems clear that there is no sharply defined limit between hairs tuberculate at the base and common hairs without such a tuber as all transition-forms

between these types of hairs are found. A characteristic of very great importance, however, are the nutlets, which differ widely in species which as regards habitus, are very similar. That this characteristic was not taken into account in earlier literature is explained by the fact that the seeds ripen comparatively late and that practically all older specimens were collected in a flowering state, when no differentiation can be observed in the young nutlet.

The nutlets of *M. kamtschatica* are smooth and provided with a broad wing-like margin (Pl. I fig. f, g, h). *M. pilosa* and *M. paniculata*, with which it was often confused, have quite different nutlets provided with irregularly toothed ridges (Pl. I, fig. i). They are also characterized by the corolla, which is hairy inside, whereas all Kamtchatka specimens of the genus have the corolla glabrous inside (unless the papillae of the nectaries are counted as hairs). *M. rivularis*, again, has nutlets with a laciniated margin (Pl. I, fig. j).

It is doubtful whether *M. kamtschatica* is the oldest name for our plant. It should probably be named *Mertensia pumila*, since as early as in 1818 a plant was described from Kamtchatica by SCHRANK under the name *Pulmonaria pumila*, which can hardly be anything but the one now in question. As I have not seen the specimens of SCHRANK (acc. to LEDEB., Fl. Ross. III p. 136 they are preserved in »museo Academiae monacensis» but in 1929 they could not be found in the Munich Herbarium), and as there is still a possibility that it was collected in the »Kamtchatka province» and not in the Kamtchatka peninsula I retain the good name of TURCZANNINOV, which is the first that without any doubt refers to our species.

The hairiness of our plant varies a good deal. The upper side of the leaves are sometimes practically glabrous or with only some few scattered tuberculate hairs towards the apex, but sometimes evenly covered by short, more or less tuberculate, hairs. The underside, which has a characteristic grayish colour, is usually evenly (in more northern specimens more densely) covered with short, more or less stiff, not tuberculate hairs, but sometimes the apical end is beset with strongly tuberculate hairs. The latter form is here described as a new variety.

var. ***scabra*** nov. var.

Folia infra, praesertim ad apicem versus pilis brevibus basi incrassatis obsita.

It may be added that the pedicels and calyx of *M. kamtschatica* bear slightly villous hairs; that the lobes of the corolla are broadest above their base, thus overlapping each other; that the nectaries are well developed, practically forming a ring round the corolla, and that the filaments are somewhat broader than the anthers.

Type of distribution: Asiatic Pacific.

Geographical area: The area of our species cannot be given without a thorough revision of the Eastern Asiatic *Mertensia* forms. Probably it extends from Chukch penins. over Gishiginsk and Kamtchatka to the Kuriles.

657. ***Mertensia maritima*** (L.) G. DON, Gen. Syst. IV (1838) p. 320.

subsp. ***asiatica*** TAKEDA in Journ. Bot. XLIX (1911) p. 222.

KUDO, Fl. Paramush. p. 152. — *Cerinthe major* GMEL., Fl. Sib. IV p. 76 quoad pl. Kamtsch.; PENNANT, Arct. Zool. (1784) p. CXIV. — [*Pulmonaria maritima* L., Sp. pl. ed. I (1753) p. 136]; MERTENS, Bemerk. Fl. Koragins p. 61; KITTLITZ, Denkw. II p. 257 . — *Lithospermum maritimum* HOOK. & ARNOTT in Beechy's Voy. p. 116. — *Mertensia maritima* LEDEB., Fl. Ross. III p. 132; HERDER, Pl. Radd. Monopet. No. 161 in Acta Horti Petrop I: 2 (1872) p. 508 et RADDE, Reisen IV: 1 p. 226; MAXIM. in Mél. Biol. VIII p. 543; YABE & YENDO, Fl. Shimushu p. (192); FEDTSCH., Fl. Îl. Comm. p. 94; PALIBIN in Acta Hort. Jurjev. 9 (1908) Jurjev 1909 p. 94; KOIDZ. in Bot. Mag. Tokyo 25 (1911) p. 218; KOM., Voy. Kamtch. pp. 146, 369, 452. — *Mertensia asiatica* MACBR. in Contr. Gray Herb. XLVIII (1916) p. 53.

Northern Kuriles: Paramushir S. YOKOYAMA 1899, M. AIZAVA 1900 acc. to KUDO loc. cit., KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka, west coast June 24th 1920 HN No. 105; the mouth of Javina R. noted by HN; Akhomten Bay Sept. 9th 1920 HN No. 1268; near the mouth of Bolshaja R. KOMAROV 1908, do. July 3rd 1921 HN No. 1927; »Paratunka» STUBENDORFF; Avatcha Bay acc. to HOOK. & ARNOTT loc. cit.

East Kamtchatka: Petropavlovsk VOSSNESENSKY, do. PERFILJEF 1910, do. Aug. 17th 1920 HN No. 927, do. Aug. 1st and 9th 1928 W. EYERDAM; the mouth of Semjatchik R. KOMAROV 1909; the mouth of Tishaja R. KOMAROV 1909; Ustj Kamtchatsk PROTOPOPOF 1909, do. BEZAIS 1909, do. July 1925 MALAISE No. 528.

Commander Island: Bering Island, STELLER acc. to FEDTSCH. loc. cit., KJELLMAN, DYBOVSKY 1879, DOBROTVORSKY 1881, GREBNITZKY 1894 and acc. to FEDTSCH. loc. cit. STEJNEGER; Copper Island STEJNEGER, TILMAN and MOREZEVICZ all acc. to FEDTSCH. loc. cit., TKATCHENKO July 17th 1911 (Hb. Holm.).

West and North Kamtchatka: Kompakovaja ZELENIN 1908; Tigil LEVITZKY 1848, do. BOGDANOVITSCH., do. BEZAIS 1909; Pallan June 27th 1927 LONGINOF; Karaga Aug. 7th 1920 HN No. 1488 (SKOBUNOF); Karaginsk Island acc. to MERTENS loc. cit., POSTELS acc. to HERDER loc. cit.

»Kamtchatka»: MERK, TILESIUS and LANGSDORFF acc. to HERDER loc. cit., STEWART, KASTALSKY, KUSMISCHEFF, MERTENS, RIEDER 1833, DYBOVSKY.

In South Kamtchatka *M. maritima* subsp. *asiatica* is common on all sandy beaches on both the eastern and the western shore. It flowers from the beginning of July to the middle of August.

The Asiatic Pacific plant of this type differs remarkably from the American and European. TAKEDA loc. cit. distinguished it as a subspecies, while MACBRIDE loc. cit. regards it as a distinct species. The most important differences are as follows:

The type: corolla small, acc. to MACBR. 4—7 mm. long, however, in more southern specimens, for instance those from Sweden, often 7 and up to 8 mm.; filaments about three times as long as the anthers; style shorter than the stamens 4—4,5 mm. rarely reaching above the middle of the anthers, usually shorter; leaves more acutish.

Subsp. *asiatica:* the whole plant usually larger, corolla larger acc. to MACBR. 8—10 mm., in Kamtchatka specimens, however, varying between 7 and 13 mm.; filaments shorter, as long as or about double as long as the anthers; filaments broader and more flattened than in the head-form; style always reaching above the top of the anthers, often considerably longer; leaves more rounded.

Since the specimens from the Commander Islands (and also those from Ustj Kamtchatsk) show less distinctly than the others the characteristics of subsp. *asiatica*, as they have smaller corolla and comparatively short style, I think that the Asiatic plant should best be regarded as a distinct geographical race of *M. maritima*. It would be of interest to examine specimens from the Aleutian Islands, which might be transitional forms. Specimens that I have seen from the Iliamna Lake region, Prince William Sound, Kodiak Island and from Port Clarence, belong to the head-form.

Type of distribution: the entire species: American, transgressing into Western Europe and Eastern Asia; subsp. *asiatica:* Asiatic Pacific.

Geographical area: the head-form: Europe: from Iceland, Jan Mayen, Spitzbergen, Kola Penins. and the shores of the White Sea southwards to Ireland, Scotland, W. Sweden (Bohuslän) and Jutland. America: from the north coast of Alaska over Victoria Land, Baffin Land and Labrador to Newfoundland, southwards on the W. coast to about 52° N. lat., on the E. coast to 41° N. lat. E. Greenland, only known from about 66° N. lat. (Angmagsalik), W. Greenland between about 65° N. lat. and 76° N. lat. Also from Chukch Penins. Subsp. *asiatica:* at least from northern Kamtchatka, Gishiginsk distr., Karaginsk and Commander Islands, southwards (on both sides of the Ochotsk Sea) to Honshu and northern Corea.

Mertensia pilosa (CHAM.) DC.

LEDEB., Fl. Ross. III p. 134.

LEDEBOUR reports ESCHSCHOLTZ as having collected this species in Kamtchatka, but he adds a note of interrogation.

I have not seen any specimen of this species from our area. It is an American plant, which is probably identical with *M. paniculata* (AIT.) DON var. *longisepala* MACBR. (Cfr. MACBR. in Contr. Gray Herb. XLVIII (1916) p. 6). *M. paniculata* as well as *M. pilosa* are characterized by the corolla, which is pilose inside, and by nutlets having irregular, toothed ridges.

658. ***Mertensia rivularis*** (TURCZ.) DC., Prodr. X (1846) p. 90.

?LEDEB., Fl. Ross. III p. 135; HERDER, Pl. Radd. Monopet. No. 186 in Acta Horti Petrop. I: 2 (1872) p. 514 et RADDE, Reisen IV: 1 p. 232. — [*Lithospermum rivulare* TURCZ. in Bull. Soc. Nat. Mosc. 13 (1840) p. 74.] — ?*Mertensia rivularis* var. *japonica* KUDO, Fl. Paramush. p. 153.

Northern Kuriles: ?Paramushir acc. to KUDO loc. cit.

Central Kamtchatka: Sources of Kashkan R. KOMAROV 1909 (sub *M. nivalis* KOM.).

West and North Kamtchatka: Karaginsk Island MERTENS acc. to LEDEB. loc. cit.

»Kamtchatka»: KASTALSKY.

This species, of which I have seen the type specimen in Hb. TURCZ., differs distinctly from *M. kamtschatica* in its small characteristically formed, abruptly pointed sepals, in having sepals and pedicels beset with short stiff hairs and in having quite different nutlets (comp. Pl. I, fig. j from the specimen Fl. Ajan No. 218, which exactly coincides with the type specimen). The specimen of KASTALSKY, which is in fruit, is in complete agreement with the type specimen, but the specimen of KOMAROV differs in having longer and softer hairs on the pedicels and sepals. As it is not in fruit the nutlets cannot settle the question of the identity of the plant, but since, with the abovementioned exception, it agrees with *M. rivularis*, I think it should be regarded as belonging to that species. The leaves are ciliated, from short stiff hairs, the corolla lobes do not overlap each other and the nectaries are more distinct from each other — all characteristics that agree with *M. rivularis*. There may be a possibility, however, that it has received a slight hybrid influence from *M. kamtschatica*.

The specimens reported from Paramushir by KUDO also seem to be somewhat doubtful, as TAKEDA's description of *Mertensia rivularis* var. *japonica* does not very well accord with that species. Judging from the description, one might rather expect that he had a *M. stylosa* form. It is impossible to express any definite opinion on this plant without access to the specimens. I have not seen the specimen of MERTENS reported by LEDEB.

Type of distribution: ?Eastern Asiatic.

Geographical area: S.E. Jakutsk distr., Ajan and Kamtchatka; also reported from the Kuriles and Yezo (var. *japonica*).

Mertensia virginica (L.) DC.

Pulmonaria virginica PENNANT, Arct. Zool. (1784) p. CXIV.

The species should be excluded from our flora.

Echium vulgare L., Sp. pl. ed. I (1753) p. 139.

East Kamtchatka: Petropavlovsk, at the farm Oct. 15th 1920 Hn No. 1476.

This species may have come to the experimental farm at Petropavlovsk with seed and then spread about that place.

A native of Europe. Introduced in some few places in Siberia, naturalized in N. America.

Labiatae Juss.

659. ***Scutellaria galericulata*** L., Sp. Pl. ed. I (1753) p. 599.

Chamisso in Linnaea VI (1831) p. 570; Erman, Verzeichn. p. 60; Ledeb., Fl. Ross. III p. 398; Herder, Pl. Radd. Monopet. No. 586 (327) in Acta Horti Petrop. X: 1 (1887) p. 27.

South Kamtchatka: Tishaja Aug. 22nd 1921 Hn N. 3641 (P. T. Novograblenof); Hutor July 19th 1928 W. Eyerdam.

Central Kamtchatka: The hot springs at Malka Komarov 1909; Kirganik Komarov 1909, do. Aug. 12th 1927 P. T. Novograblenof; 40 verst from Shtchapina on the way to Kronoki Komarov 1909.

»Kamtchatka»: Lubarsky, Kusmischeff acc. to Herder loc. cit.; Stewart (Hb. Berol.), Rieder (Hb. Berol.).

S. galericulata is apparently rare in Kamtchatka. The flowers of the collected specimens are on an average larger than the Scandinavian. They may belong to the type described by Kudo in Journ. Coll. Sc. Tokyo XLIII (1921) No. 8 p. 12 as *S. yezoensis*, which can hardly be maintained as a separate species as its distinguishing characteristics lie within the range of variation of *S. galericulata*. It might possibly be an Asiatic Pacific variety of that species.

Type of distribution: Circumpolar.

Geographical area: Europe: from Scotland, northern Scandinavia, Kola penins. and northern Russia, southwards to central Spain and Italy, the Balkans and Caucasus. Asia: at Yenisei from about 62° N. lat., from Vilju and Jakutsk districts and Central Kamtchatka, southwards to Asia minor, Kashmir (acc. to Hook.), Mongolia, northern Manchuria and Honshu. America: from Alaska to Newfoundland, southwards to Arizona and N. Carolina. Also in N. Africa.

Scutellaria scordiifolia Fisch.

Benth. in DC., Prodr. XII p. 425; Ledeb., Fl. Ross. III p. 398.

Bentham's report reads: ». . . in Kamtchatka (Pallas!)». Pallas, however, did not visit Kamtchatka. By »Kamtchatka» may be meant the Kamtchatka province, which comprises also Ochotsk, where this plant is found, and not the Kamtchatka Peninsula. The species should be excluded from the flora of our area.

Glechoma hederacea L.

»*Glechoma foliis reniformibus crenatis . . .*» GMEL., Fl. Sib. III p. 242. — *Nepeta Glechoma* BENTH., LEDEB., Fl. Ross. III p. 379; HERDER, Pl. Radd. Monopet. No. 568 (309) in Acta Horti Petrop. X: 1 (1887) p. 4; KRYLOF, Fl. Altaja IV p. 1030.

GMELIN reports this plant from Kamtchatka without mentioning the collector. LEDEBOUR only repeats his report, while HERDER records MERTENS as collector. KRYLOF cites MAXIMOWICZ's manuscript on a Kamtchatka flora, in which, however, MAXIMOWICZ only cites GMELIN and LEDEB. No specimens could be found labelled Kamtchatka and the species should certainly be excluded from the flora of our area.

Dracocephalum grandiflorum L.

CHAMISSO in Linnaea VI (1831) p. 570; LEDEB., Fl. Ross. III p. 385.

The specimens (in Hb. Berol.) on which the report of this plant from Kamtchatka is based were collected by REDOWSKY, who died before reaching the Peninsula. The *Dracocephalum* species that comes closest to Kamtchatka is *D. palmatum* STEPH., which goes down to the Gishiginsk distr.

The species must be excluded from the flora of our area.

Dracocephalum sibiricum L.

GEORGI, Beschreib. III: 5 p. 1095.

The species should be excluded from the flora of our area.

660. ***Prunella vulgaris*** L., Sp. pl. ed. I (1753) p. 600.

»*Prunella e specimine manco haud tute determinanda; an grandiflora* POLLICH» CHAMISSO in Linnaea VI (1831) p. 570. — »*Prunella. An grandiflora* PALLAS?» ERMAN, Verzeichn. p. 60. — *Prunella grandiflora* LEDEB., Fl. Ross. III p. 392. — *Prunella vulgaris* var. *japonica* KUDO, Fl. Paramush. p. 153.

Northern Kuriles: Paramushir KUDO 1920.

South Kamtchatka: The hot spring at upper Unkanakchek Aug. 19th 1922 HN No. 4306; the waterfall at upper Unkanakchek below the hot spring noted by HN; the hot springs at upper Karymchina 220 m. Sept. 6th 1921 HN No. 3070, do. covering spots of hot ground noted by HN; the hot springs at Siku R. KOMAROV 1908; the hot springs at upper Bannaja R. RUBINSKI 1909, do. 440 m. Sept. 12th 1921 HN No. 3228; the hot spring »Malenki Klutchik», Bannaja noted by HN.

East Kamtchatka: Petropavlovsk at the farm Aug. 28th 1923 P. T. NOVOGRABLENOF.

In South Kamtchatka *P. vulgaris* was only found near hot springs. At Upper Karymchina R. it was growing abundantly at certain spots of hot ground that occurs in the neighbourhood of the hot springs. These specimens belong to var. *lanceolata* (BART.) FERN., although the median cauline leaves of some of them are only slightly narrower than those of the European plant.

The specimen from Petropavlovsk is only a fragment, but as it is broader-leaved it might belong to the European form of this species and have been introduced. Compare FERNALD in Rhodora 15 (1913) p. 179—186.

Type of distribution: The head-form, European—Western Asiatic; var. *lanceolata:* American transgressing into Eastern Asia.

Geographical area: The head-form: from Iceland, northern Scandinavia, Finland and Russia southwards to the Mediterranean Sea. Asia: at Obi from about 61° N. lat., at Yenisei from about 65° N. lat., southwards to Syria, northern Persia and India. Also in N. Africa; introduced into E. America, Chile and Australia. It seems doubtful whether the head-form ever occurs otherwise than introduced E. of Lake Baikal. In the southern part of the area given above chiefly var. *hispida* BENTH. Var. *lanceolata:* Asia: Kamtchatka, Japan, Saghalin, Manchuria, Corea and China. America: from Alaska to Newfoundland, southwards to California and N. Carolina. In America several other forms. (See FERNALD loc. cit.).

661. ***Galeopsis bifida*** BOENNINGH., Fl. Monast. Prodr. (1824) p. 178.

Galeopsis tetrahit LEDEB., Fl. Ross. III p. 420 quoad pl. Kamtsch.; HERDER, Pl. Radd. Monopet. No. 591 (332) in Acta Horti Petrop. X: 1 (1887) p. 33; KOM. in Herb. quoad pl. Kamtsch.

South Kamtchatka: Kurile Lake Aug. 27th 1922 HN No. 4407; Unkanakchek R. below the hot spring noted by HN; »Zolotoi Jarr», Golygina R. RUBINSKI 1909; Golygina R. about 8 km. above the village Aug. 6th 1921 HN No. 2733; the hot springs at Savan R. 110 m. July 31st 1921 HN No. 2511; 20 km. S. of Bolsheredsk Aug. 18th 1921 HN No. 2900; Bolsheredsk Aug. 22nd 1921 HN No. 2905; between Bolsheredsk and Apatcha KOMAROV 1908; Apatcha noted by HN; the hot springs at Siku R. noted by HN; »Perisheik», Tarja Bay PERFILJEF 1910; Natchika village noted by HN; the hot springs at Natchika KOMAROV 1908; Savoiko KOMAROV 1908, do. July 9th 1920 HN No. 353, do. July 10th 1928 W. EYERDAM, do. Aug. 1st 1928 MALAISE.

East Kamtchatka: Petropavlovsk DOBROTVORSKY 1881, do. PERFILJEF 1910, do. July 17th 1920 HN No. 534, do. July 19th 1920 HN No. 598.

Central Kamtchatka: Malka STUBENDORFF 1849; Mashura Aug. 9th 1921 HN No. 3512 (MALAISE); Shtchapina GRINOP 1909, do. July 21st 1921 HN No. 3465 (MALAISE); Klutchi BEZAIS 1908, do. AFANASEJEV 1909 (sub *G. tetrahit* β *silvestris*), do. PROTOPOPOF 1909.

West and North Kamtchatka: Chairusovaja NOVIKOF 1909.

»Kamtchatka»: ESCHSCHOLTZ, KUSMISHEFF, KASTALSKY, »Petropavlovsk MERTENS», PETERS 1831, RIEDER 1831.

G. bifida should certainly be regarded as a separate species. It is the only *Galeopsis* form in Kamtchatka. It is hardly indigenous within our area as it was never observed in the part of the country that is not visited by

hunters. It is, however, often found around old camping-places in the woods, even far from the villages, and is probably the most wide-spread non-indigenous plant within our area.

As *G. bifida* is very often united with *G. tetrahit*, it is impossible to give the area of these species separately without revising a large amount of material from Europe and Asia. All that I have seen of this type from Eastern Siberia and Japan has been *G. bifida*.

Type of distribution: Eurasiatic.

Geographical area: Throughout Europe and Asia, naturalized in N. America.

662. ***Lamium album*** L., Sp. pl. ed. I (1753) p. 579.

var. ***petiolatum*** Nakai, Fl. Korea II (1911) p. 154.

Central Kamtchatka: Mashura Komarov 1909; Shtchapina July 18th 1921 Hn No. 3452 (Malaise).

Whether the plant is indigenous within our area or not I cannot say.

Type of distribution: The entire species: Eurasiatic. var. *petiolatum:* Eastern Asiatic.

Geographical area: The entire species: Europe from Scotland, central Scandinavia and Finland and the northern Urals southwards to northern Spain and Italy and southern Russia. Asia: at Obi and Yenisei from about 69° N. lat. and from the Jakutsk distr., southwards to the Himalayas, China, Corea and Kiushiu (introduced into N. America). Var. *petiolatum* reported from China, Manchuria, Jakutsk distr., Saghalin, Japan, central Kamtchatka and also from India. The area is uncertain, as apparently other closely related forms occur in Eastern Asia.

663. ***Stachys Riederi*** Chamisso in Linnaea VI (1831) p. 570.

Erman, Verzeichn. p. 60; DC., Prodr. 12 p. 468; Ledeb., Fl. Ross. III p. 412. — *Stachys baicalensis* Fisch. in Benth., Labiatae (1832—36) p. 543. — *Stachys aspera* β *baicalensis* Maxim. in Bull. Mosc. 54 (1879) p. 44; Herder, Pl. Radd. Monopet. No. 590 (331) in Acta Horti Petrop. X: 1 (1887) p. 32.

South Kamtchatka: The hot springs at upper Unkanakchek R. Aug. 19th 1922 Hn No. 4321; middle Golygina R. (below the hot spring) Aug. 6th 1921 Hn No. 2734; the hot spring at upper Karymchina R. 400 m. Sept. 12th 1921 Hn No. 3109; the hot springs at Siku R. Komarov 1908, do. Sept. 5th 1921 Hn No. 3044; the hot springs at upper Bannaja R. Sept. 12th 1921 Hn No. 3223; the hot springs at »Gorachie gora», Paratunka R. Komarov 1908; Paratunka Stubendorff 1849, do. Komarov 1908; the hot springs at Paratunka village June 17th 1921 Hn No. 1767 b; »mys Perisheik» Tarja Perfiljef 1910; Nikolajevsk Aug. 11th 1920 Hn No. 841; the hot springs at Natchika Vossnesensky 1848, do. Komarov 1908 (Hb. Berol.), do. Sept. 2nd 1921 Hn No. 2992.

East Kamtchatka: Near Petropavlovsk Aug. 13th 1928 W. Eyerdam; between Petropavlovsk and Korjatskaja volcano Aug. 12th 1928 W. Eyerdam.

Central Kamtchatka: The hot springs at Malka STUBENDORFF, do. KOMAROV 1908, do. July 22nd 1924 P. T. NOVOGRABLENOF; Mashura KOMAROV 1909; between Mashura and Shtchapina Aug. 6th 1921 HN No. 3502; Shtchapina KOMAROV 1909; Klutchi BEZAIS 1908; Lake Kurarotchnoje BEZAIS 1908 (Hb. Berol.); Jelovka R. BEZAIS 1909.

»Kamtchatka»: STEWART, KUSMISCHEFF, »Petropavlovsk MERTENS», »RIED. Kamt. Ad ERMAN Hb. CHAM. *S. Riederi* n.» (Hb. Acad. Petrop., type of the species).

Only a few of the localities enumerated above can be proved to have no connection with hot springs. The species flowers in August and September.

S. Riederi was described by CHAMISSO from a specimen collected by RIEDER. Unfortunately this specimen does not represent the common form of the plant. It is a thin- and large-leaved, more glabrous shadow-form, but it agrees fairly well with the only shadow-form of the plant that I collected during my journeys in South Kamtchatka, viz. HN No. 841, and I cannot see that it is possible to retain the later name *S. baicalensis* for this species, although it might be desirable as it is already well-known under that name.

S. Riederi represents, together with the Western Siberian—European—American *S. palustris* L., a circumpolar type. It differs from the latter plant in its articulated bristles and in its stems being glabrous on the sides (or having some few bristles of the same type as those on the angles) but bristly on the angles. In Japan and on Saghalin it is replaced by *S. japonica* MIQ. which differs in its long-petiolated lower leaves, divergent calyx-teeth and smooth stems (or stems with small hooked prickles on the angles) (Compare KUDO in Journ. Coll. Sc., Tokyo XLIII (1921) Art. 8 p. 34), and in Manchuria and China by the practically glabrous, large-flowered *S. chinensis* BUNGE.

Type of distribution: Eastern Asiatic.

Geographical area: From about Lake Baikal and Vilju distr. eastwards, in the north from Jakutsk distr. and N. Kamtchatka, southwards to N. Manchuria and Saghalin. The closely related *S. palustris* from about Yenisei westwards to the Atlantic Ocean and throughout N. Amer. *S. japonica* from the southern Kuriles and Saghalin to southern Japan; *S. chinensis* from Manchuria southwards to southern China.

664. ***Thymus Serpyllum*** L., Sp. pl. ed. I (1753) p. 590.

HERDER, Pl. Radd. Monopet. No. 558 (299) in Bull. Mosc. 61: 1 (1885) p. 148 et RADDE, Reisen IV: 6 p. 30 (γ *vulgaris*).

West and North Kamtchatka: Tigil RIEDER 1831, do. BEZAIS 1909; Pallan June 27th 1927 LONGINOF.

»Kamtchatka»: MERK. acc. to HERDER loc. cit.; KUSMISCHEFF.

As the *Thymus*-forms of Asia are not yet revised it is hardly worth while trying to give a closer determination. The specimens are decumbent with sparse-hairy leaves, long-ciliated especially in their lower part. The species seems to be restricted to northern Kamtchatka.

Type of distribution: Eurasiatic.

Geographical area: (*T. Serpyllum* sens. lat.) Europe: from Iceland, northern Scandinavia and Russia southwards to the Mediterranean Sea. Asia: throughout Siberia from Yalmal, lower Lena river and Chukch Penins., southwards to Asia Minor, India, Northern China and Japan (not known from southern and central Kamtchatka or the Kuriles). Also in southern Greenland and in Africa. Introduced into E. America.

665. ***Lycopus uniflorus*** Michx., Fl. Bor. Amer. I (1803) p. 14.

Lycopus virginicus Herder, Pl. Radd. Monopet. No. 556 (297) in Bull. Mosc. 61: 1 (1885) p. 132 et Radde, Reisen IV: 6 p. 14. — *Lycopus parviflorus* Maxim., Prim. Fl. Amur. in Mém. Ac. Imp. Sc. St. Petersb. par div. sav. IX (1859) p. 216; Kudo in Journ. Coll. Sc. Tokyo XLIII (1921) No. 8 p. 42. — *Mentha arvensis* var. *lapponica* Kom., Voy. Kamtch. p. 453.

South Kamtchatka: The hot spring at Unkanakchek R. Aug. 19th 1922 Hn No. 4319; the hot springs at Savan R. (Saan) Rieder 1833 (sub *Mentha* sp. later corrected to *L. virginicus*), do. July 31st 1921 Hn No. 2509; the hot springs at Siku R. Komarov 1908, do. Sept. 5th 1921 Hn No. 3047; the hot spring »Malenki Klutchik» Bannaja 375 m. Sept. 12th 1921 Hn No. 3158; the hot springs at upper Bannaja R. 440 m. Sept. 12th 1921 Hn No. 3225; the hot springs at Natchika Komarov 1908 (in the field taken for *Mentha lapponica* compare Kom. loc. cit.), do. Sept. 2nd 1921 Hn No. 3001, do. July 30th 1924 P. T. Novograblenof.

East Kamtchatka: the hot springs at Uzon crater Komarov 1909.

»Kamtchatka»: Vossnesensky (sub *L. parviflorus* scripsit Maxim.).

In Kamtchatka this plant seems to be restricted to the hot springs, where it occurs in a narrow zone (usually some decimetres broad) close to the hot brooks. I cannot see that our plant differs in any important respect from the American *L. uniflorus*. (Comp. Fernald in Rhodora 6 (1904) p. 134.) It has the tuberous base of the stem characteristic of that species; the form of the leaves, the hairiness, the form of the calyx as well as the slightly excerted stamens, agree well with it and I can see no reason for separating the two plants specifically. The calyx is four or five-toothed as well in the American as in the Asiatic plant, and abnormally deformated calyx-forms are often found, which is certainly due to the fact that the flowers are very crowded in the whorls.

Kamtchatka specimens have somewhat smaller flowers than the American plant, those of the larger Saghalin plant agree fairly well in this respect also with American specimens.

Type of distribution: American, transgressing into Eastern Asia.

Geographical area: Asia: S.E. Kamtchatka, the Kuriles southwards from Eterofu, Saghalin, Yezo, Honshu and northern Manchuria. America: from British Columbia to Labrador and Newfoundland southwards to Oregon, Wyoming and Michigan.

666. ***Mentha arvensis*** L., Sp. pl. ed. I (1753) p. 577.

CHAMISSO in Linnaea VI (1831) p. 570; ERMAN, Verzeichn. p. 60; LEDEB., Fl. Ross. III p. 338; HERDER, Pl. Radd. Dicotyl. Monopet. No. 551 (292) in Bull. Mosc. 61:1 (1885) p. 119 et RADDE, Reisen IV: 6 p. 1. — *Mentha lapponica* DC., Prodr. 12 p. 173; LEDEB., Fl. Ross. III p. 340. — *Mentha canadensis* HERDER, Pl. Radd. Monopet. No. 552 (293) in Bull. Mosc. 61: 1 (1885) p. 125 et RADDE, Reisen IV: 6 p. 7 quoad pl. Kamtsch.

South Kamtchatka: Mt. »Gorachie gora» upper Paratunka valley at the hot springs KOMAROV 1908, do. RUBINSKI 1909; Paratunka Aug. 20th 1921 HN No. 3644 (P. T. NOVOGRABLENOF); Poperochnaja R. KOMAROV 1908; »Südspitze von Kamtchatka» acc. to ERMAN loc. cit.

Central Kamtchatka: Sharomsk KOMAROV 1909; Milkova BEZAIS 1908; Mashura KOMAROV 1909, do. Aug. 7th 1921 HN No. 3504 (MALAISE); Klutchi BEZAIS 1908; the mouth of Jelovka R. BEZAIS 1909.

»Kamtchatka»: MERK ex Hb. PALL. in Hb. FISCH., STEWART, RIEDER.

Kamtchatka specimens of this plant have short calyx-teeth and do not belong to subsp. *haplocalyx* BRIQ. which otherwise, acc. to BRIQUET, is the Eastern Asiatic representative of the species. It is more common to the north and seems to be absent in the southernmost part of the peninsula, as well as in the northern Kuriles. In the southern Kuriles and on Saghalin another form, subsp. *haplocalyx* var. *sachalinensis* (= *M. sachalinensis* (BRIQ.) KUDO), occurs.

Our plant strongly resembles subsp. *lapponica* WAHLENB. (as species) from which, however, it differs in its hairy pedicels. Until the *Mentha* forms of Asia have been subjected to critical treatment it is of little use trying to make a closer determination.

Type of distribution: Circumpolar.

Geographical area; A very critical type occurring in a multitude of forms throughout Europe, Asia and N. America, also in N. Africa.

Solanaceae HALL.

Solanum tuberosum L.

HERDER, Pl. Radd. Monopet. No. 195 in Acta Horti Petrop. I: 2 (1872) p. 558 et RADDE, Reisen IV: 1 p. 275. — »*pommes de terre*» LANGSDORFF, Remarque Kamtch. prod. nat. (1812) p. 101. — »*Kartoffelbau*» KOTZEBUE, Reise u. d. Welt II p. 10. — *Solanum dulcamara* (lapsus calami) KOM., Voy. Kamtch. p. 452.

Since the beginning of the 19th century potatoes have been cultivated in Kamtchatka. During my stay there their cultivation was going on on a small scale, although a good crop could be gathered. Potatoes are sometimes imported from Japan.

Scrophulariaceae LINDL.

667. ***Pentstemon frutescens*** LAMB. in Transact. Linn. Soc. X (1811) p. 259 tab. 6 fig. 1.

TRAUTV. in Mem. Ac. Imp. Sc. St. Petersb. par. div. sav. IV (1845) p. 247; LEDEB., Fl. Ross. III p. 222; HERDER, Pl. Radd. Monopet. No. 210 in Acta Horti Petrop. I: 2 (1872) p. 578 et RADDE, Reisen IV: 1 p. 296; KUDO, Fl. Paramush. p. 154.

Northern Kuriles: Paramúshir M. AIZAVA 1900, acc. to KUDO loc. cit., KUDO 1920.

South Kamtchatka: »Perishejk» Ozernaja RUBINSKI 1909; »Pakiusu R.» (= Pausetek R.) near »Kurilski Lopatka» Sept. 11th 1847 VOSSNESENSKY; N.W. of Kurile Lake 600 m. and 1050 m. noted by HN; Illina Volcano 490 m. noted by HN; W. Shadutka R. noted by HN; W. of Shadutka volcano 250 m. noted by HN; Topik 470 m. noted by HN; Assatcha mts. 1125 m. noted by HN; Akhomten Bay 350 m. Sept. 11th 1920 HN No. 1293; Tikhirka Bay RIEDER 1831; Opala volcano 1040 m. July 21st 1921 HN No. 2301; Lake Tolmachovaja 600 m. noted by HN; mt. »Babi kamen», Paratunka R. KOMAROV 1908; mt. Trubi, Vilju R. KOMAROV 1908.

East Kamtchatka: S. of Avatcha volcano 300 m. noted by HN; Avatcha volcano PERFILJEF 1911 (Hb. Berol.), do. 675 m. July 30th 1920 HN No. 603.

Central Kamtchatka: Gremushej R. KOMAROV 1908; the foot of Mt. Aak KOMAROV 1908; Korjatskaja volcano Aug. 14th 1928 W. EYERDAM.

»Kamtchatka»: PETERS 1831.

This beautiful and peculiar plant (illustrated in Pl. 3) is not rare in the southern part of Kamtchatka. It flowers in July and August. It is the only species of the otherwise American genus *Pentstemon* that occurs in Asia. It has been reported from the Urals — a report which is certainly incorrect and is due to PALLAS, who first mentions our species in a manuscript, having called it *Digitalis dasyantha*, which name was erroneously associated with *Digitalis ambigua* MURR. In PALLAS' manuscript our species was also reported from Unalashka — a report that was doubted even by ASA GRAY and which, as far as I know, is not yet verified. I have not been able to find any modern report of *P. frutescens* from America.

Type of distribution: Asiatic Pacific.

Geographical area: Known from Taoiskaja Guba! (N. shore of Ochotsk Sea), Ochotsk, southern Kamtchatka, northern and southern Kuriles, Yezo and some few localities in the mts. of Honshu. The report from Unalashka is unreliable.

668. ***Limosella aquatica*** L., Sp. pl. ed. I (1753) p. 631.

YABE & YENDO, Fl. Shimushu p. (194).

Northern Kuriles: Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Hutor Sept. 6th 1928 MALAISE.

East Kamtchatka: The mouth of Karau R. Sept. 18th 1909 KOMAROV (Hb. Holm. mixed in a sheet of *Subularia aquatica*); the mouth of Korenevskaja R. KOMAROV 1909; the mouth of Jurtochnaja R. KOMAROV 1909; the mouth of Tishaja R. KOMAROV 1909; Lake Kronoki KOMAROV 1909.

Central Kamtchatka: Shtchapina KOMAROV 1909.

Type of distribution: Cosmopolite.

Geographical area: Europe: from Iceland, northern Scandinavia and northern Russia southwards. Asia: at Yenisei from about 70° N. lat., from Jakutsk distr. and Kamtchatka, southwards to Himalaya, Manchuria and Yezo. America from British Columbia and Alberta southwards to Mexico and from Labrador (53° N. lat.) to Newfoundland (48° N. lat.) (acc. to FERNALD). W. Greenland, S. America, Australia, Africa.

669. ***Veronica americana*** SCHWEINITZ ap. BENTH. in DC., Prodr. X (1846) p. 468.

HERDER, Pl. Radd. Monopet. No. 483 (224) in Bull. Mosc. 58: 1 (1883) p. 386 et RADDE, Reisen III: 3 »Heft VI» p. 20; YABE & YENDO, Fl. Shimushu p. (194); FEDTSCH., Fl. Îl. Comm. p. 94; KUDO, Fl. Paramush. p. 154; PENNELL in Rhodora 23 (1921) p. 34. — *Veronica Anagallis* LEDEB., Fl. Ross. III p. 236 quoad pl. Kamtsch. — *Veronica Beccabunga* LEDEB., Fl. Ross. III p. 237 quoad pl. ex Insulis Beringii et Unalashka.

Northern Kuriles: Paramushir C. TARO 1892, I. KODAMA 1893 both acc. to KUDO loc. cit., KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: S. of Kambolnaja R. RUBINSKI 1909; the mouth of Ozernaja R. GUDZENKO 1910; the hot spring at upper Unkanakchek R. noted by HN; Golygina village noted by HN; upper Ksudach R. noted by HN; upper Shadutka R. 250 m. Aug. 3rd 1921 HN No. 2619; the hot spring at Shadutka noted by HN; Opala R. 60 verst from the mouth RUBINSKI 1909; upper Savan R. noted by HN; upper Opala R. near Assatcha noted by HN; Akhomten Bay Sept. 22nd 1920 HN No. 1457; Agashka R. noted by HN; the hot springs at Karymchina R. noted by HN; Bolsheredsk noted by HN; Siku R. KOMAROV 1908; the hot spring »Malenki klutchik» Bannaja noted by HN; Paratunka KOMAROV 1908, do. at the hot springs June 17th 1921 HN No. 1777; between Nikolajevsk and Hutor KOMAROV 1908; the Natchika Pass KOMAROV 1908; Savoiko July 20th 1928 MALAISE.

East Kamtchatka: Petropavlovsk PERFILJEF 1910, do. July 17th 1920 HN No. 492, do. July 8th 1928 W. EYERDAM; Kichpinitch volcano KOMAROV 1909; Lake Assabatch Aug. 15th 1925 MALAISE No. 530.

Commander Islands: Bering Island STELLER and STEJNEGER acc. to FEDTSCH., loc. cit., GREBNITZKY 1880; Copper Island GREBNITZKY 1894, STEJNEGER acc. to FEDTSCH. loc. cit.

Central Kamtchatka: Malka Stubendorff 1849; Shtchapina July 21st 1921 Hn No. 3464 (Malaise); Anauna R. Aug. 22nd 1926 Malaise No. 378, do. at the hot spring in water 20° C. Sept. 3rd 1926 Malaise No. 376.

West and North Kamtchatka: Krutugorovaja Zelenin 1908.

»Kamtchatka»: Langsdorff, Stewart, Kastalsky, Kusmischeff, »Petropavlovsk Mertens», Peters 1831, Rieder.

In South Kamtchatka *V. americana* is fairly common by brooks and springs in the lowlands.

Our plant is closely related to *V. Beccabunga*, from which it differs in its acute, short-petiolated leaves, long fruiting pedicels and longer style. *V. Anagallis*, which is also closely related to it, has sessile leaves, longer and more densely-flowered racemes, usually shorter fruiting pedicels and smaller capsules.

Type of distribution: American transgressing into Eastern Asia.

Geographical area: Asia: Udskoj distr., Saghalin, the southern half of Kamtchatka Penins., Commander Islands, the Kuriles and Yezo. America: from the Aleutian Islands to Newfoundland southwards to California, Mexico, Nebraska, the Great Lake region, Tennessee and S. Carolina. *V. Beccabunga* in Europe and Asia eastwards to about Yenisei, W. Tibet and Himalaya. *V. Anagallis* throughout N. America, Europe and Asia (in the north from Tomsk Prov., southern Jeniseisk prov., southern Manchuria and Honshu southwards); also in S. America and in Africa.

670. ***Veronica grandiflora*** Gaertn. in Nov. Comm. Ac. Imp. Sc. St. Petersb. XIV (1770) p. 531 tab. 18 fig. 1.

Pennell in Rhodora 23 (1921) p. 33; Römpp in Fedde, Rep. spec. nov. L (Beiheft) (1928) p. 125; Hultén in Sv. Bot. Tidskr. 22 (1928) p. 223.[1] — *Veronica Kamtschatica* L. fil., Suppl. Syst. Veg. (1781) p. 83; Georgi, Beschreib. III: 4 p. 548 *(camtschatica);* Yabe & Yendo, Fl. Shimushu p. (194). — *Veronica aphylla* β Roem. & Schult., Syst. Veg. I p. 104; Erman, Verzeichn. p. 58. — *Veronica aphylla* β *grandiflora* Benth. in DC., Prodr. X (1846) p. 476; Ledeb., Fl. Ross. III p. 245; Herder, Pl. Radd. Monopet. No. 487 (228) in Bull. Mosc. 58: 1 (1883) p. 398 et Radde, Reisen (IV: 3) »Heft VI» p. 32; Fedtsch., Fl. Îl. Comm. p. 95; Kudo, Fl. Paramush. p. 155. — *Veronica aphylla* Georgi, Beschreib. III: 4 p. 548; Kom., Voy. Kamtch. p. 212.

Northern Kuriles: Paramushir Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Illina volcano Aug. 23rd 1922 Hn No. 4394; mt. Dogshinag, Golygina R. Rubinski 1909 (hb. Acad. Petrop., part of the specimens); Shadutka volcano 1125 m. Aug. 2nd 1921 Hn No. 2582; Assatcha

[1] The area of this species in Kamtchatka is somewhat wider than that given in the map in that paper. Compare the map No. 670 at the end of this paper. The species should perhaps not be included in the »Northern Pacific» group of plants as its area outside Kamtchatka is very small.

mts. at the source of Opala R. July 30th 1922 Hn No. 4091, do. N.W. slope noted in A. 177; Listvenichnaja Bay Rieder 1831 (sub *V. Michauxii*); Akhomten Bay 50 m. Sept. 18th 1920 Hn No. 1416 (var. *latifolia*); Mutnovskaja volcano 800 m. July 27th 1922 Hn No. 4015, do. 1460 m. noted by Hn; Gorelaja volcano 800 m. July 14th 1922 Hn No. 3941 and 3949 (A. 171); Opala volcano 1040 m. July 21st 1921 Hn No. 2279 (A. 71, A. 73); mt. »Babi Kamen», Paratunka R. Komarov 1908; mt. »Zaikin mys», Paratunka R. Komarov 1908; mt. Trubi, Vilju R. Komarov 1908; Lake Natchika Komarov 1908 (var. *latifolia*); mt. Tshapochka Komarov 1909; Shalsan valley Komarov 1908; Uzdets R. Komarov 1908; Poperochnaja R. Komarov 1908; mt. Palovinaja, Savoiko 800 m. July 8th 1920 Hn No. 298, do. at the top Aug. 1st 1928 W. Eyerdam; the Korjaka valley Rubinski 1908; near Korjaka Komarov 1908.

East Kamtchatka: Avatcha volcano Perfiljef 1911, do. 900 m. July 30th 1920 Hn No. 586, do. 1100 m. noted by Hn; Kichpinitch volcano Komarov 1909 (var. *latifolia*); the Kronoki Pass Komarov 1909 (var. *latifolia*); Klutchevskaja volcano Bezais 1908, do. Kozlovski, do. Kurtashof 1909, do. Aug. 6th 1927 Malaise; Ploskaja volcano, »pervaja na dolu sopotshka» Protopopof 1908; Ustj Kamtchatsk July 1925 Malaise No. 529; Shivelutch acc. to Erman loc. cit.

Commander Islands: Bering Island Steller acc. to Fedtsch. loc. cit., Dybovsky 1879, and acc. to Fedtsch. loc. cit. Grebnitzky, Stejneger and Morozevicz; Copper Island Stejneger, Tilman and Morozevicz all acc. to Fedtsch. loc. cit.

Central Kamtchatka: Malka Protopopof 1908; Gremushej R. Komarov 1908; Ganala Komarov 1909 (var. *latifolia*); mt. »Ganalski Vystraki» July 18th 1924 P. T. Novograblenof; Kamtchatka Vershina Komarov 1909; Anauna R. Aug. 29th 1926 Malaise No. 377 (var. *latifolia*), do. Sept. 9th 1926 Malaise No. 383; Klutchi Afanasejev 1909.

West and North Kamtchatka: Between Sedanka and Jelovka Bezais 1909; Tigil Levitzky (unreliable, not original label), do. collector unknown Hb. Turcz. (unreliable).

»Kamtchatka»: Steller acc. to Gaertn. loc. cit., »Habitat in Kamtsch. et insulis» Willd. Herb. No. 216; Merk acc. to Herder loc. cit., Eschscholtz, Stewart, Kusmischeff.

Noted in the following associations:

In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 71, A. 73, A. 177).

In *Artemisia arctica—Rhododendron kamtschaticum—Salix »arctica»* ass.:
Single (A. 171).

In South Kamtchatka *V. grandiflora* is common in the meadows of the

alpine region up to near the alpine limit of vegetation. It flowers in July and the beginning of August.

Our plant has often been treated, even in the most recent works, as a variety of *V. aphylla*. From that plant it differs considerably, not only in habitus but also in detail. LINNAEUS describes *V. aphylla* with »*corymbo terminali*». This, however, is not the case; the racemes are axillary, although the top of the shoot above the base of the scape is stunted, so that the scape appears to be terminal. In *V. grandiflora* this apical part of the shoot above the base of the scape is much larger, and it is at once apparent that the racemes are axillary. *V. grandiflora* is a much larger plant than *V. aphylla;* it has ovate-lanceolate sepals of about the same breadth from the base to about half their length, then tapering to the apex, while those of *V. aphylla* are narrower at the base and broadest at the middle. The petals of *V. grandiflora* are broader than they are long; its filaments have downwards-turned hair-like papillae on their lower half; its styles are longer than the petals and as much as double the length of the ripe capsule, and the capsules are about double as long as they are broad, while *V. aphylla* has less broad petals, glabrous filaments, and the styles usually only about half as long as the capsules, which are shorter and rounder.

In regard to hairiness and the form of the leaves, *V. grandiflora* is fairly variable. Specimens with thin, comparatively long and narrow leaves (27×10, 35×14 mm. HN No. 4015) are found as well as specimens with thick and very broad leaves (31×21, 47×26 mm.), while the common form comes between these figures. The upper side of the leaves and their margins, as well as the scapes and the sepals, are usually hairy with long, articulated hairs, although more glabrous forms with only slightly ciliated leaves and short-hairy scapes and sepals also occur.

One of these forms differs considerably from the type and may be taken as a separate variety, var. ***latifolia*** nov. var.

Folia late elliptica, fere sessilia utrinque glabra, margine ciliata. Scapus et calyx brevipilosa.

Type of distribution: ?Northern Pacific.

Geographical area: Asia: Commander Islands, Kamtchatka, Shumshu, Paramushir. America: the Aleutian Islands: Attu Island, Kiska Island.

671. ***Veronica humifusa*** DICKSON in Transact. Linn. Soc. 2 (1794) p. 288.

»*Veronica racemo terminali subspicato . . .*» GMEL., Fl. Sib. III p. 223 saltem quoad pl. Kamtsch. — *Veronica serpyllifolia* PENNANT, Arct. Zool. (1784) p. CXIV; CHAMISSO in Linnaea 2 (1827) p. 558 saltem quoad pl. Kamtsch.; LEDEB., Fl. Ross. III p. 248 quoad pl. Kamtsch.; HERDER, Pl. Radd. Monopet. No. 492 (233) in Bull. Mosc. 58: 1 (1883) p. 404 et RADDE, Reisen IV: 3 »Heft VI» p. 38 (also var. *thymifolia*) (quoad pl. Kamtsch.); FEDTSCH., Fl. Îl. Comm. p. 96; KOIDZ. in Bot. Mag., Tokyo 25 (1911) p. 218; KOM. in herb. quoad pl. Kamtsch.

South Kamtchatka: Javina village noted by HN; Golygina village

Vossnesensky 1847, do. noted by Hn; Bolsheredsk Bezais 1909, do. July 8th 1921 Hn No. 2018; 10 km. W. of Bolsheredsk Aug. 26th 1921 Hn No. 2973; Paratunka village Komarov 1908, do. at the hot spring June 17th 1921 Hn No. 1776; Nikolajevsk Aug. 11th 1920 Hn No. 851; upper Uzdets R. Komarov 1908; Natchika village noted by Hn; the hot springs at Natchika Rubinski 1909; the Natchika Pass Komarov 1908; Savoiko July 7th 1920 Hn No. 260 a, do. June 8th 1928 Malaise, do. June 29th 1928 W. Eyerdam; the Korjaka valley Rubinsky 1908.

East Kamtchatka: Petropavlovsk Vossnesensky 1848, do. Yokoyama acc. to Koidz. loc. cit., do. July 17th 1920 Hn No. 479, do. June 18th 1928 W. Eyerdam.

Commander Islands: Copper Island Dybovsky 1879 and acc. to Fedtsch. loc. cit. Dobrotvorsky, Stejneger and Morozevicz.

Central Kamtchatka: Malka Komarov 1909; between Ganala and Pushtchina Grinop 1909; Klutchi Bezais 1908, do. Kurtashof 1909.

West and North Kamtchatka: The mouth of Kishtchik R. Bezais 1908; Krutugorovaja Zelenin 1908; Tigil Levitzky 1848, do. Herb. Turcz.

»Kamtchatka»: Steller acc. to Gmel. loc. cit., Collector unknown, probably Steller, Willd. Herb. No. 201 sub *V. fontana*; Lubarsky acc. to Herder, loc. cit., Stewart, Kusmischeff, Peters 1831, Rieder 1833, Rieder (sub *V. kamtschatica* n. sp. later added *V. thymifolia* Fisch. in herb.), Stubendorff.

In South Kamtchatka *V. humifusa* was observed on paths and in the neighbourhood of human habitations. At Bolsheredsk and lower Bolshaja R. it was also growing as a pioneer on mudbanks in the rivers. It was never observed in those parts of the country that are not frequented by the natives and may thus be regarded as doubtfully indigenous within our area.

V. humifusa has often been taken to be a subspecies, variety, or even a form of *V. serpyllifolia* L. It differs from that species in its larger, darker blue flowers, and in having especially the upper part of the stem pubescent with long, viscid and often gland-tipped hairs. Both in Scandinavia and in Kamtchatka it often has radicant branches close to the base of the stem, which is not noticeable in *V. serpyllifolia*. In Sweden it occurs on the low mountains from southern Lapland northwards, while *V. serpyllifolia* is common in the lowlands throughout that country.

From Kamtchatka our plant was described by Willdenow as *V. fontana*. In Scandinavian literature it is known as *V. serpyllifolia* var. *borealis* Laest., but latterly it has been regarded as a separate species. All of this type that I have seen from Eastern Asia belonged to *V. humifusa*. Compare Pennell in Rhodora 23 (1921) p. 16.

Type of distribution: Circumpolar.

Geographical area: The area is difficult to state as the plant was very

often united with *V. serpyllifolia*. It occurs in northern Europe, in the Central European mts., the Pyrenees etc. In Asia: southwards to India and Japan. America: from Alaska to Labrador and Newfoundland, southwards to Mexico and northern New England.

Veronica incana L.

PENNANT, Arct. Zool. (1784) p. CXIV; GEORGI, Beschreib. III: 4 p. 647; LEDEB., Fl. Ross. III p. 235; cfr. HERDER, Pl. Radd. Monopet. No. 481 (222) in Bull. Mosc. 58: 1 (1883) p. 380 et RADDE, Reisen IV: 3 »Heft VI» p. 11. — *Veronica spicis terminalibus, foliis oppositis crenatis obtusis . . .*» GMEL., Fl. Sib. III p. 220.

All the above-enumerated records of *V. incana* from Kamtchatka are based on GMELIN's report. The species occurs in Jakutsk prov. and Kolyma, but GMELIN's report from Kamtchatka has not been confirmed. The species should be excluded from the flora of our area.

672. ***Veronica scutellata*** L., Sp. pl. ed. I (1753) p. 12.

South Kamtchatka: »Verchnjeje ozero» (= the upper lake) mt. Tshapochka, Natchika KOMAROV 1908 (sub *V. thymifolia*).

The specimens of KOMAROV are very small and are single-flowered, but, as far as I can see, they differ in no way from dwarf specimens of *V. scutellata* from Scandinavia. Acc. to the label they were found on the bottom of a dried-up lake.

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland, northern Scandinavia and Finland and Perm prov. southwards to the Mediterranean Sea and the Caucasus. Asia: at Obi from about 61° N. lat.; at Yenisei from about 66° N. lat. southwards to Minusinsk distr. Also known from Yakutsk distr. and from Kamtchatka. America: from Yukon to Labrador and Newfoundland southwards to California, Wyoming, Indiana and Virginia.

673. ***Veronica Stelleri*** PALL. ex SPRENG., SCHRAD. u. LINK, Jahrb. III (1820) p. 40.

CHAMISSO in Linnaea II (1827) p. 557; BENTH. in DC., Prodr. X p. 481; LEDEB., Fl. Ross. III p. 147; HERDER, Pl. Radd. Monopet. No. 490 (231) in Bull. Mosc. 58: 1 (1883) p. 400 et RADDE, Reisen IV: 3 »Heft VI» p. 34; MIYABE, Fl. Kuril. p. 254; YABE & YENDO, Fl. Shimushu p. (194); FEDTSCH., Fl. Îl. Comm. p. 95; KUDO, Fl. Paramush. p. 154; RÖMPP. in FEDDE, Rep. Spec. Nov. L (Beiheft) (1928) p. 24; HULTÉN in Sv. Bot. Tidskr. 22 (1928) p. 225.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDÓ loc. cit.

South Kamtchatka: Cape Lopatka RIEDER 1831 and 1833, do. Sept. 11th 1847 VOSSNESENSKY; N.W. of Kurile Lake 500 m. noted in A. 210; »Paudschinski (Pausetek) Mineral Quellen auf dem Cap Lopatka 16 Sept. 1847»

Vossnesensky; W. of Sholtovskaja volcano noted in A. 205; mt. Dogshinag, Golygina R. Rubinski 1909 (Hb. Acad. Petrop. mixed in a sheet of *V. grandiflora*); Topik 580 m. July 28th 1921 Hn No. 2501; Assatcha mts. at the source of Opala R. July 31st 1922 Hn No. 4088; Assatcha mts. W. slope Aug. 10th 1922 Hn No. 4197 (A. 177); Akhomten Bay Aug. 30th 1920 Hn No. 1173 (Malaise), do. 250 m. Sept. 9th 1920 Hn No. 1214 b, do. 250 m. Sept. 11th 1920 Hn No. 1291, do. Sept. 22nd 1920 Hn No. 1473 (A. 31); Gorelaja volcano 800 m. July 14th 1922 Hn No. 3950; Opala volcano 1040 m. July 21st 1921 Hn No. 2331, do. July 23rd 1921 Hn No. 2367 (A. 77, A. 78 a); the Kohelok Pass, 780 m. Sept. 11th 1921 Hn No. 3129 (A. 125); mt. »Seljoni gor» Lake Natchika Ramenski 1908; Shalsan Komarov 1908; the Shalsan Pass 700 m. Sept. 1st 1921 Hn No. 2986 e; Tshapotchka, Natchika Komarov 1908; Poperochnaja R. Komarov 1908; Savoiko July 7th 1920 Hn No. 260 b.

East Kamtchatka: Avatcha volcano 1050 m. noted by Hn.

Commander Islands: Bering Island Grebnitzky, Stejneger, Morozevicz all acc. to Fedtsch. loc. cit.; Copper Island Stejneger acc. to Fedtsch. loc. cit.

»Kamtchatka»: Merk (Hb. Fisch.), Peters, Rieder 1831.

Noted in the following associations:
In *Artemisia arctica—Solidago—Viola Langsdorffi* ass.:
Single (A. 77, A. 78 a, A. 125); Sparse A. (210).
In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 31, A. 177, A. 205).

V. Stelleri is not rare in the meadows of the alpine region in South Kamtchatka. It flowers from July to September.

Type of distribution: Northern Pacific.

Geographical area: Asia: Commander Islands, South Kamtchatka, the northern and southern Kuriles, Yezo, Saghalin, Honshu. America: the Aleutian Islands, Pribilof Islands, »Alaska».

674. ***Lagotis glauca*** Gaertn. in Nov. Comment. Ac. Sc. St. Petersb. XIV (1770) p. 534 t. 18, fig. 2.

Maxim. in Mél. Biol. XI (1881) p. 297 (1 *borealis* Maxim. var. *Gmelini* (Cham. & Schlecht.) Maxim.); Herder, Pl. Radd. Monopet. No. 544 (285) in Bull. Mosc. 59: 1 (1884) p. 239 et Radde, Reisen IV: 5 p. 9 (α *borealis* f. *Gmelini*); Fedtsch., Fl. Îl. Comm. p. 98 (var. *Gmelini* et var. *Stelleri*); Kom., Voy. Kamtch. p. 87; Kudo, Fl. Paramush. p. 155. — »*Veronica foliis inferioribus ovatis crenatis . . .*» Gmel., Fl. Sib. III p. 219. — »*Veronica* Gmel. Sib. III 219 No. 33» Pennant, Arct. Zool. (1784) p. CXIV. — *Bartsia Gymnandra* Georgi, Beschreib. Nachtr. p. 281 quoad pl. Kamtsch. — *Gymnandra borealis* Pallas, Reise d. Versch. Prov. Russ. Reich. III Anhang p. 710 quoad var. ex Kamtchatka et Insula Beringii. — *Gymnandra Gmelini* Cham. & Schlecht. in Linnaea II (1827) p. 561; Ledeb., Fl. Ross. III p. 332. — *Gymnandra Pallasii* Ledeb., Fl. Ross. III p. 332 quoad pl. Kamtsch.

Northern Kuriles: Paramushir T. Matsubara 1915 acc. to Kudo loc. cit.

South Kamtchatka: N.W. of Kurile Lake 600 m. and 1050 m. noted by Hn; Topik 580 m. July 28th 1921 Hn No. 2500; Assatcha mts. 1125 m. noted by Hn; Akhomten Bay Aug. 30th 1920 Hn Nos. 1166, 1167 (Malaise), do. 250 m. Sept. 11th 1920 Hn No. 1294; Mutnovskaja volcano 800 m. July 28th 1922 Hn No. 4028, do. up to 1460 m. noted by Hn; Lake Tolmachovaja 600 m. July 12th 1922 Hn No. 3896; Seljdovaja pad. R. Komarov 1908; Lake Natchika Komarov 1908; Shalsan Vossnesensky 1847, do. 700 m. Sept. 1st 1921 Hn No. 2985 c.

East Kamtchatka: Avatcha volcano Perfiljef 1911; »von dem Vorgebirge Schipun und von der Kamtschatischen Gebirgskette, 1831 (Rieder)» acc. to Herder loc. cit.; Uzon crater Komarov 1909; the Kronoki Pass Komarov 1909; N.E. slope of Klutchevskaja volcano Afanasejev 1909; Klutchevskaja volcano 3600 feet Bezais 1908 (sub var. *Stelleri*), do. Kurtashof 1909 (sub var. *Stelleri*), do. 5000 feet Kozlovski 1909 (sub var. *Stelleri*), do. Aug. 6th 1927 Malaise.

Commander Islands: Bering Island Steller acc. to Cham. & Schlecht. loc. cit., Kjellman, and acc. to Fedtsch. loc. cit. Dybovsky, Stejneger and Grebnitzky; Copper Island Dybovsky 1879, Stejneger and Morozevicz acc. to Fedtsch. loc. cit., Aug. 26th 1921 Sandberg (Hb. Holm., infected by a zoocecidium).

Central Kamtchatka: Gremushej R. acc. to Kom. loc. cit.; Malka Komarov 1908; Korjatskaja volcano Aug. 12th and 13th 1928 W. Eyerdam.

West and North Kamtchatka: Between Sedanka and Jelovka Bezais 1909 (sub var. *Stelleri*); Karaginsk Island Mertens, do. Loginovski 1910.

»Kamtchatka»: Collector unknown »E Kamtschatka Pallas» (sub *Gymnandra integrifolia* Willd. in Hb. Hort. Bergian. Stockholm).

In South Kamtchatka *L. glauca* occurs here and there in the mountains up to the alpine limit of vegetation. It is common in the neighbourhood of Mutnovskaja volcano.

L. glauca belongs to a critical group which occupies the whole of northern Asia and neighbouring parts of Europe and America. Within this large area several closely related forms occur which have been regarded by several authors as belonging to one species and as being subspecies, varieties or even forms of *L. glauca*, while other authors take them to be separate and distinct species. As far as I can see, the central Asiatic plant, which should be named *L. Pallasii* (Cham. & Schlecht.) Rupr., differs very distinctly from both the arctic plant and from the Eastern Asiatic and has its closest relatives in the Himalayas, where several of its relatives occur.

The two other types in N. Asia, the arctic *L. Stelleri* (Cham. & Schlecht.) Rupr. and the northern Pacific *L. glauca*, are certainly more closely related to each other, and it will be necessary to obtain larger collections from the northern part of the Bering Sea, where their areas meet, before the question as to whether they pass gradually into each other there, or whether the limit

is sharply defined, can be settled. The difference, however, between the plants from Southern Kamtchatka and the mouth of the Yenisei, for instance, is so manifest that it seems obvious that they should be referred to different species. The specific characteristics of the three above-mentioned plants are given below.

L. Pallasii (fig. 1, c; description made from Altai specimens): the calyx strongly ciliated with white articulated hairs, even its apex being often white-hairy on the back; the tube of the corolla thick, curved in its lower part, becoming black when dried; the upper lip about 5×1,2 mm. sometimes bifurcated to the base, the lower divided into 2, sometimes 3, narrow lanceolate lobes about 5×1 mm.; all corolla lobes acute; filaments very short, in their lower part grown together with the upper lip, the anthers thus being affixed close to the base of the lip.

L. glauca (fig. 1, b; description made from specimens from South Kamtchatka): the calyx sparsely ciliated, glabrous on the back; the tube of the corolla narrower, somewhat funnel-shaped, thin, irregularly curved, usually not becoming black when dried or at any rate only in its lower part; the upper lip rectangular, 2—3,5×2 mm., more or less emarginate, the lower divided into 2—3 lobes 1,5—3×1,5 mm., blunt or acutish; filament grown together with the upper lip to about its half length, then with more or less long free parts usually of about the length of the lobes of the anthers, the anthers thus usually reaching slightly above the middle of the upper lip and not above it; seed about 4—5 mm. long; leaves ovate to circular, crenate-dentate with truncate or cordate base, in var. *lanceolata* more or less serrulated.

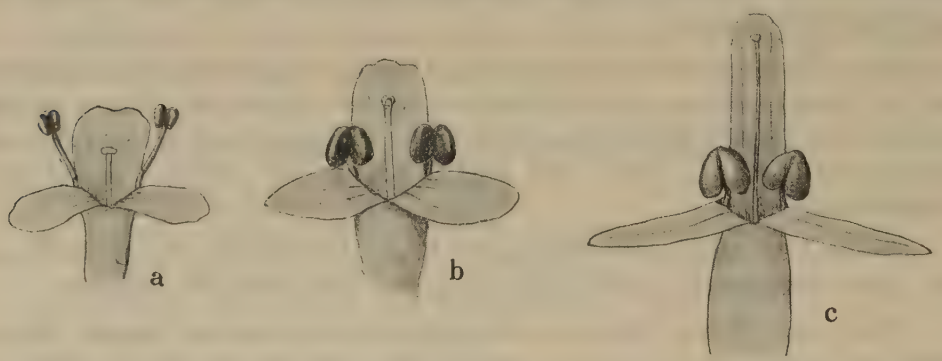


Fig. 1. Flowers of: a. *Lagotis Stelleri* from the mouth of Yenisei. b. *Lagotis glauca* from Kamtchatka. c. *Lagotis Pallasii* from Altai. All enlarged four times.

L. Stelleri (fig. 1, a; description derived from specimens from the lower Yenisei) resembling the preceding, but the corolla smaller, usually with narrower lobes, the filaments affixed to the lower half of the upper lip, then with a long thin free part much longer than the lobes of the anthers; anthers smaller, reaching above the upper lip; style often excerted; seed longer, about 7 mm., more distinctly reticulated; leaves lanceolate to ovate-lanceolate with a few sharp teeth.

That GAERTNER had our plant and not the Central Asiatic plant in view when he described his *Lagotis glauca* seems clear from the description of the, at that time monotypic, genus *Lagotis*, in which it is said to have »labio superiore reflexo emarginato . . . filamenta duo brevissima . . . stylus filiformis longitudine staminum» — characteristics that distinguish it both from *L. Pallasii* and from *L. Stelleri*. Also, the details of the flowers (loc. cit. fig. 2 c tab. XVIII) (although the illustration is not very good) are so characteristic that it is clear that our plant is meant.

Some of the specimens from Kamtchatka, as well as some from Ajan and the northern part of Bering Sea, differ from the common form of *L. glauca* in having more narrow, sometimes sharply serrulated radical leaves and somewhat longer filaments, and in these respects approach *L. Stelleri* to which I have previously referred them (HULTÉN in Sv. Bot. Tidskr. 19 (1925) p. 107 quoad pl. Kamtsch.). With the limitation that I have given to that species here, however, it should be referred to *L. glauca*, but it may be regarded as a separate variety, var. ***lanceolata*** nov. var.

Foliis radicalibus lanceolatis vel ovato-lanceolatis sparse serratis vel crenato-serratis; filamenta vulgo quam in forma typica longiora sed labio superiore distincte breviora.

In Kamtchatka this type is more common towards the north, and the specimens from Klutchevskaja volcano, Sedanka-Jelovka and Karaginsk Island belong to it.

Type of distribution: *L. glauca*: Northern Pacific; *L. Stelleri*: Asiatic transgressing into Western America; *L. Pallasii*: Central Asiatic.

Geographical area: *L. glauca*: Asia: from the Bering Straits southwards to Ajan and Yezo. America: the Aleutian Islands and Alaska southwards to ? *L. Stelleri*: from Nova Zembla and the northern Urals eastwards along the coast to Chukch Penins. In America: eastwards to about the mouth of the Mackenzie R. *L. Pallasii*: from the Urals to Altai, Sajan mts., Dahuria, Turkestan, N. China and ?the Himalayas.

675. ***Castilleja pallida*** (L.) KUNTH in Synops. Plant. aequinoct. orbis novi (1823) p. 100 (in nota ad *C. lithospermoides*).

LEDEB., Fl. Ross. III p. 258; HERDER, Pl. Radd. Monopet. No. 494 (235) in Bull. Mosc. 58: 1 (1883) p. 410 et RADDE, Reisen IV: 3 »Heft VI» p. 44. — »*Bartsia foliis alternis bidentatis*» L., Amoen. Acad. II ed. I (1751) p. 356 (Pl. Rar. Kamtsch. p. 23). — *Bartsia pallida* L., Sp. Pl. ed. I (1753) p. 602; PENNANT, Arct. Zool. (1784) p. CXVI.

South Kamtchatka: Illina volcano 490 m. noted by HN; upper Kusingen R. near Sahach noted in A. 190; upper Ksudach R. noted by HN; the western Shadutka R. noted by HN; upper Opala R. noted in A. 184, A. 185; the hot springs at upper Opala R. Aug. 4th 1922 HN No. 4161 (A. 182); Akhomten Bay Aug. 30th 1920 HN No. 1175 (MALAISE), do. 250 m. Sept. 9th 1920 HN No. 1206 (A. 26); Opala volcano 1040 m. July 21st 1921 HN No. 2302 (A. 78 a); the Kohelok Pass 750 m. noted in A. 125; the hot springs at

Bannaja R. Rubinski 1909; upper (Paratunka-)Bystraja R. noted in A. 128; mt. Trubi, Vilju R. Komarov 1908; Nikolajevsk Komarov 1908 (Hb. Berol.); Natchika Komarov 1908; mt. Zerkalo, Natchika 725 m. noted in A. 118; Poperochnaja R. Savitch 1908; mt. Palovinaja 700 m. July 8th 1920 Hn No. 294 b, do. Aug. 1st 1928 W. Eyerdam; Savoiko Komarov 1908, do. July 14th 1928 W. Eyerdam.

East Kamtchatka: The entrance to Avatcha Bay Perfiljef 1911; between Petropavlovsk and Savoiko July 9th 1920 Hn No. 411; Avatcha volcano Perfiljef 1911, do. 900 m. July 30th 1920 Hn No. 576; mt. Krasheninnikof Komarov 1909; Uzon crater Komarov 1909; the Kronoki Pass Komarov 1909; Klutchevskaja volcano 3600 feet Bezais 1908, do. Kurtashof 1909; Lake Assabatch Aug. 10th 1925 Malaise No. 532; Ustj-Kamtchatsk July 30th 1925 Malaise Nos. 531 and 533; Shivelutch 3500 feet Kozlovski 1910.

Central Kamtchatka: Gremushej R. Komarov 1908; Korjatskaja volcano Aug. 12th and 14th 1928 W. Eyerdam; mt. Aak Komarov 1908; Ganala Komarov 1909; Anauna R. Aug. 19th 1926 Malaise No. 371; Klutchi Bezais 1908, do. July 27th 1926 Malaise No. 372.

West and North Kamtchatka: Tigil Levitzky (the place is not given in the original label), do. collector unknown Hb. Turcz.

»Kamtchatka»: Eschscholtz and acc. to Herder loc. cit. Stewart, Kastalsky, Kusmischeff, Peters and Rieder.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 182, A. 184, A. 185, A. 190).

In *Artemisia arctica—Solidago—Viola Langsdorffi* ass.:
Single (A. 78 a, A. 118, A. 125).

In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 26, A. 128).

In South Kamtchatka *C. pallida* occurs in the alpine region in the meadows up to their altitudinal limit. It is also found, though rarely, in the lowlands.

All Kamtchatka specimens are strongly puberulent and the upper leaves caudate-falcate. The median stem-leaves vary from narrowly lanceolate, or practically linear, entire to broadly lanceolate or ovate-lanceolate, caudate. This plant seems also to be represented in Alaska and the adjacent parts of W. America, whereas most of the American material of this type belongs to *C. septentrionalis*, which might also be regarded as a subspecies of *C. pallida*, and which differs in being glabrous or practically so, and in having entire, and, judging from the material I have seen, only very rarely caudate, ovate upper leaves.

Type of distribution: ?

Geographical area: Europe: Kola Penins., Kanin, Kolgujef, Nova Zembla and the arctic Russian mainland, in the Urals southwards to Orenburg. Asia:

along the Arctic Coast from the Urals to Chukch Penins., southwards to northern Akmolinsk prov., southern Tomsk prov., Yenisei (to about 61° N. lat.), Transbaikalia, Amur prov. and southern Kamtchatka. America: Alaska and Mackenzie southwards to British Columbia and Alberta (acc. to RYDB.). The closely related *C. septentrionalis* LINDL. (= *C. pallida* var. *septentrionalis*) from Alaska 60° N. lat. to Labrador 60° N. lat. southwards to Colorado 39° N. lat. and New Hampshire 44° N. lat. (acc. to FERNALD). The plant from Banks Land and Victoria Land was reported by SIMMONS as var. *septentrionalis*.

676. ***Euphrasia mollis*** (LEDEB.) WETTSTEIN, Monogr. Euphrasia (1896) p. 141.

FEDTSCH., Fl. Îl. Comm. p. 96; FERNALD & WIEGAND in Rhodora 17 (1915) p. 190; KUDO, Fl. Paramush. p. 155; HULTÉN in Sv. Bot. Tidskr. 22 (1928) p. 223. — *Euphrasia officinalis* γ *mollis* LEDEB., Fl. Ross. III p. 263. — *Euphrasia officinalis* γ *alpestris* var. *mollis;* HERDER, Pl. Radd. Monopet. No. 500 (241) in Bull. Mosc. 58: 2 (1883) p. 46 et RADDE, Reisen IV: 4 »Heft VI» p. 52 quoad pl. Kamtsch. — *Euphrasia officinalis* YABE & YENDO, Fl. Shimushu p. (194) (acc. to KUDO loc. cit.).

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka RIEDER 1831; on the shore between Ozernaja and Javina Aug. 13th 1921 HN No. 2863; between Javina and Kochegochek noted by HN; Sahach noted in A. 191; Kusingen R. Aug. 16th 1922 HN No. 4262; middle Ksudach R. Aug. 6th 1921 HN No. 2713; between the mouths of Golygina and Opala rivers Sept. 10th 1922 HN No. 4560; Toporkoff Island Aug. 8th 1920 HN No. 810, do. Aug. 15th 1920 HN No. 903; Savoiko KOMAROV 1908, do. July 28th and Aug. 2nd 1928 W. EYERDAM.

Commander Islands: Bering Island GREBNITZKY 1894, STEJNEGER acc. to FEDTSCH. loc. cit., Aug. 18th 1921 SANDBERG (Hb. Holm.); Copper Island Aug. 26th 1921 SANDBERG (Hb. Holm.).

»Kamtchatka»: Collector unknown »E Kamtsch.» Hb. Berol.

E. mollis is not common in South Kamtchatka. It was only seen at the places enumerated above. It was most abundant on Toporkoff Island.

WETTSTEIN had only seen unbranched individuals of our species and he did not know the colour of the flowers. Among the large number of specimens in my collection about 1 in 10 are branched. The flowers of all specimens which I have seen in Kamtchatka are dark-yellow. FERNALD loc. cit. states that American specimens have purple flowers. (*E. minima* in the Alps shows a similar behaviour.)

Type of distribution: Northern Pacific.

Geographical area: Asia: Commander Islands, South Kamtchatka, the Kuriles and Yezo. America: the Aleutian Islands and south coast of Alaska to Lynn Channel.

677. ***Rhinanthus groenlandicus*** CHABERT im Bull. Herb. Boiss. 7 (1899) p. 515, emend. OSTENF., Botany of the Faröes (1901) p. 54.

Rhinanthus crista galli FEDTSCH., Fl. Îl. Comm. p. 96.

Commander Islands: Copper Island STEJNEGER acc. to FEDTSCH. loc. cit., do. Aug. 26th 1921 SANDBERG (Hb. Holm.).

SANDBERG's specimen is in fruit, but its large capsules and hairy calyx identify it with this species, especially with that form of it which was described by STERNECK as *Alectorolophus borealis*, and which OSTENFELD loc. cit. considers to be synonymous with var. *Drummond-Hayi* B. WHITE, based on specimens from the Scottish Highlands.

Type of distribution: American, transgressing into W. Europe and E. Asia.

Geographical area: Europe: known from Iceland, the Faroes, Scotland and the Scandinavian mts. Asia: for the present only known from Copper Island. America: throughout N. America from Alaska (60° N. lat.) to Labrador (59° N. lat.), southwards to Alaska (52° N. lat.) and New Hampshire (44° N. lat.). S. W. Greenland.

Pedicularis adunca M. a. BIEB. in STEVEN, Monogr. Pedicularis (1822) p. 29 tab. V. fig. 2 et in Mém. Soc. Nat. Mosc. VI (1823) p. 29.

LEDEB. Fl. Ross. III p. 282; HERDER, Pl. Radd. Monopet. No. 517 (258) in Bull. Mosc. 58: 2 (1883) p. 83 et in RADDE, Reisen IV: 4 »Heft VI» p. 94.

All the above-enumerated records of *P. adunca* from Kamtchatka are apparently founded on STEVEN's report that reads »Camtschatca (herb. Willd. qui e Stephanio habuit)». By Kamtchatka was certainly meant the Kamtchatka province, not the peninsula, and the specimens on which the report was based may thus have been collected on the western shore of the Ochotsk Sea. MAXIMOWICZ probably realized this and does not give Kamtchatka as the home of this plant (Bull. Ac. Imp. Sc. St. Petersb. XXIV, 1878, p. 75). Compare also under *P. Rubinskii*.

678. ***Pedicularis capitata*** ADAMS in Mém. Soc. Nat. Mosc. V (1817) p. 100.

STEVEN in Mém. Soc. Nat. Mosc. VI (1823) p. 19 tab. 3 fig. 2; BUNGE in LEDEB., Fl. Ross. III p. 301, HERDER, Pl. Radd. Monopet. No. 531 (272) in Bull. Mosc. 58: 2 (1883) p. 102 et RADDE, Reisen IV: 4 »Heft VI» p. 113; MAXIM. in Mél. Biol. X: I (1878) p. 127 in Bull. Ac. Imp. Sc. St. Petersb. 24: 1 (1878) p. 84 et 34 (1888) tab. VI fig. 163; LIMPR. in FEDDE, Rep. Spec. Nov. XX (1924) p. 198.

South Kamtchatka: Cape Lopatka »in montibus non procul a Schumtu» Sept. 1847 VOSSNESENSKY; Kambolnaja BEZAIS 1909; Ut. Dogshinag RUBINSKI 1909; Assatcha mts. 1125 m. noted by HN; Mutnovskaja volcano 800 m. July 28th 1922 HN No. 4032; Gorelaja volcano 825 m. noted in A. 164, do. 900 m.

noted in A. 168, A. 170, A. 171; Lake Tolmachovaja 600 m. July 11th 1922 HN No. 3883; Opala volcano 1100 m. July 21st 1921 HN No. 2287; mt. Tshapotchka, Natchika KOMAROV 1908; sources of Poperochnaja R. KOMAROV 1908 (Hb. Berol.).

East Kamtchatka: The Penishivo Pass July 28th 1928 W. EYERDAM; Lake Kronoki KOMAROV 1909; the Kronoki Pass KOMAROV 1909; Klutchevskaja volcano BEZAIS 1908, do. 3500 feet KOZLOVSKI 1909, do. AFANASEJEV 1909, do. Aug. 6th 1927 MALAISE; Ploskaja volcano »pervaja na dolu sopotchka» PROTOPOPOF 1909.

Central Kamtchatka: The Ganala mts. KITTLITZ, do. July 18th 1924 P. T. NOVOGRABLENOF; Anauna R. Sept. 5th 1926 MALAISE No. 368.

West and North Kamtchatka: Between Sedanka and Jelovka BEZAIS 1909; Tigil (Hb. TURCZ.); Karaginsk Island MERTENS, do. »Exp. LÜTKE» (Hb. Holm.).

»Kamtchatka»: »*Pedicularis Stelleriana* Ex Kamtschatka STELLER Com PALLAS»; KUSMISCHEFF, RIEDER.

Noted in the following associations:

In *Vaccinium—Diapensia*—Lichen ass.:
Single (A. 164, A. 168, A. 170).
In *Artemisia arctica—Rhododendron kamtschaticum—Salix »arctica»* ass.:
Single (A. 171).

In South Kamtchatka *P. capitata* is found here and there on the heaths and in meadows, especially in the higher alpine region. It flowers in July and August.

Type of distribution: Asiatic-American.

Geographical area: Asia: from about the mouth of Obi R. eastwards along the coast to Chukch Penins. and southwards in the mts. to south Kamtchatka. America: the north coast of Alaska over the Arctic Archipelago to Ellesmereland and along the coast to northern Hudson Bay and Baffin Land, southwards to the southern coast of Alaska and the mts. of southern British Columbia. Also in N.W. Greenland. A map of the distribution is given by FERNALD in Mém. Gray. Herb. II (1925) p. 325 fig. 59, to which should be added localities on the lower Yenisei R., Taimyr R. and Kamtchatka.

679. ***Pedicularis Chamissonis*** STEVEN, Monogr. Pedicularis (1822) p. (20) tab. IV fig. 1 et in Mém. Soc. Nat. Mosc. VI (1823) p. 20.

HERDER, Pl. Radd. Monopet. No. 503 (244) in Bull. Mosc. 58: 2 (1883) p. 68 et RADDE, Reisen IV: 4 »Heft VI» p. 79; MAXIM. im Mél. Biol. X (1878) p. 90 et in Bull. Ac. Imp. Sc. St. Petersb. XXIV (1877) p. 58; MIYABE, Fl. Kuril. p. 254; FEDTSCH., Fl. Îl. Comm. p. 97; YABE & YENDO, Fl. Shimushu p. (193); KUDO, Fl. Paramush. p. 156 (var. *Maximoviczii*); LIMPR. in FEDDE, Rep. Spec. Nov. XX (1924) p. 242.

Northern Kuriles: Paramushir C. Taro 1892, T. Matsubara 1915 both acc. to Kudo loc. cit., Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka w. coast June 24th 1920 Hn No. 147 b; 30 verst from the mouth of Ozernaja R. Rubinski 1909; »Hot springs Sept. 16th 1847» Vossnesensky; Kurile Lake noted in A. 208; N.W. of Kurile Lake noted in A. 210; between Javina and Kochegochek noted in A. 91, A. 92; W. of Sholtovskaja volcano 500 m. Aug. 23rd 1922 Hn No. 4363 (A. 205); Sahach Aug. 16th 1922 Hn No. 4284 (A. 191); S. of Golygina village noted by Hn; 25 verst above Golygina village Rubinski 1909; upper Ksudach R. noted by Hn; middle Ksudach R. noted in A. 84; upper Savan R. 250 m. July 31st 1921 Hn No. 2537, do. Aug. 1st 1921 Hn No. 2559 (A. 79); Assatcha mts. at the source of Opala R. July 31st 1922 Hn No. 4100; Akhomten Bay 250 m. Sept. 9th 1920 Hn No. 1203, do. Sept. 21st 1920 Hn No. 1438 (A. 26, A. 31, A. 38); Mutnovskaja volcano July 27th 1922 Hn No. 4017; N.W. of Opala volcano noted in A. 67, A. 69, A. 73; upper Abshen R. 250 m. July 17th 1921 Hn No. 2190; the Kohelok Pass 750 m. noted by Hn; Alochkin »tundra» Paratunka R. Komarov 1908; Lake Natchika W. shore Aug. 4th 1924 P. T. Novograblenof (f. flor. albis); Shalsan Vossnesensky 1847; mt. Tshapotchka, Natchika Komarov 1908 (Hb. Berol.); mt. Zerkalo, Natchika noted in A. 118, A. 119; Poperochnaja R. Komarov 1908, do. Savitch 1908.

East Kamtchatka: The Kronoki Pass Komarov 1909; the foot of Klutchevskaja volcano Kurtashof 1909.

Commander Islands: Bering Island Kjellman, Dybovsky 1879, Grebnitzky 1880 and 1894, Dobrotvorsky 1881, Stejneger acc. to Fedtsch, loc. cit., Gudzenko 1910; Copper Island Dybovsky 1879 and acc. to Fedtsch. loc. cit. Stejneger, Tilman 1890, Grebnitzky 1896 and Morozevicz 1903.

West and North Kamtchatka: Tigil (Herb. Turcz.) unreliable.

»Kamtchatka»: Kastalsky acc. to Herder loc. cit., »Petropavlovsk Mertens», Peters, Rieder.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 67, A. 69, A. 79, A. 84, A. 91, A. 92, A. 119, A. 191).
In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Single (A. 118, A. 210).
In *Artemisia arctica—Solidago—»Salix arctica»* ass.:
Single (A. 26, A. 31, A. 38, A. 73, A. 205, A. 208).

In South Kamtchatka *P. Chamissonis* is fairly common in the meadows of the lowlands and the lower alpine region. It flowers in July and the beginning of August.

In his description of this species STEVEN says that it has yellow flowers but »sicca obscure violacea». This is certainly a mistake. The flowers of the living plant are light purplish-red with the apex of the galea darker. The calyx is also purplish-red with brownish veins and border. STEVEN reports the plant from »alpibus Corgonensibus» which is also undoubtedly a mistake, as already pointed out by LEDEBOUR. The species is so characteristic that in any case there can hardly be any doubt as to its identity.

In Japan the closely related form *P. japonica* MIQ. is often united with our species as a variety. This plant differs from *P. Chamissonis* chiefly in its long rostrum. The illustration given by MAXIM. in Bull. Ac. Imp. Sc. St. Petersb. XXXII tab. V fig. 90 is merely this plant. In Kamtchatka hardly any transition forms to that type could be found. The flowers of the Kamtchatka plant are illustrated in Pl. 1 fig. m, n.

Type of distribution: Northern Pacific.

Geographical area: Asia: S.E. Kamtchatka, the Commander Islands, the Kuriles, Yezo and S. Saghalin. America: the Aleutian Islands, Sitcha. In Japan (Honshu) var. *japonica* MAXIM., which might be a distinct species.

680. ***Pedicularis eriophora*** TURCZ. in Bull. Soc. Nat. Mosc. XXIV (1851) p. 333 in nota.

MAXIM. in Mél. Biol. X (1878) p. 97. — *Pedicularis amoena* ?ADAMS in STEVEN Monogr. Pedicularis p. 25 quoad pl. Kamtsch.; BUNGE in LEDEB., Fl. Ross. III p. 271 quoad pl. Kamtsch.; HERDER, Pl. Radd. Monopet. No. 507 (248) in Bull. Mosc. 58: 2 (1883) p. 73 et RADDE, Reisen IV: 4 »Heft VI» p. 84 quoad pl. Kamtsch.; KOMAROV in herb. quoad pl. Kamtsch.

South Kamtchatka: W. of Illina volcano noted in A. 207; Sholtovskaja volcano 500 m. Aug. 23rd 1922 HN No. 4381; mt. »Dogshinag» Golygina R. RUBINSKI 1909 (Hb. Acad. Petrop. the specimen to the right); Mutnovskaja volcano 800 m. July 27th 1922 HN. No. 4018; Gorelaja volcano July 14th 1922 HN No. 3951 b (A. 164, A. 166, A. 168, A. 170); Opala volcano 1040 m. July 21st 1921 HN No. 2343, do. 1300 m. noted by HN; Lake Tolmachovaja 800 m. July 11th 1922 HN No. 3884; mt. Zaikin Mys. Paratunka KOMAROV 1908; mt. Palovinaja, Savoiko July 22nd 1928 MALAISE, do. July 14th and Aug. 1st 1928 W. EYERDAM; Poperochnaja R. KOMAROV 1908.

East Kamtchatka: Avatcha volcano PERFILJEF, do. 900 m. July 30th 1920 HN No. 695; the Kronoki Pass KOMAROV 1909; Klutchevskaja volcano 3600 feet BEZAIS, do. KOZLOVSKY, do. PROTOPOPOF 1909, do. AFANASEJEF 1908 (sub *P. Chamissonis*), do. N.E. slope July 22nd 1926 P. T. NOVOGRABLENOF, do. Aug. 6th 1927 MALAISE.

Central Kamtchatka: Gremushej R. KOMAROV 1908; Korjatskaja volcano Aug. 14th 1928 W. EYERDAM; mt. Ganalski Vystraki July 18th 1924 P. T. NOVOGRABLENOF; Anauna R. Sept. 5th 1926 MALAISE No. 366.

West and North Kamtchatka: Between Sedanka and Jelovka BEZAIS 1909; Tigil Hb. TURCZ.

»Kamtchatka»: ?STELLER acc. to STEVEN loc. cit.

Noted in the following association:

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 207).
In *Vaccinium—Diapensia*—Lichen ass.:
Single (A. 164, A. 166, A. 168, A. 170).

In South Kamtchatka this plant occurs here and there in the alpine and high-alpine region. It flowers in July and August.

P. eriophora differs from *P. verticillata* in several respects, for instance in having larger flowers and long narrow calyx-teeth, and in having the anthers lying close together, not two at some distance from the others, as is the case with *P. verticillata*. In these characteristics, as well as in some others, it approaches *P. amoena* ADAMS, to which it is certainly closely related. As all Kamtchatka specimens of the *P. amoena* type differ in certain respects from those from other parts of Siberia, I think that it is impossible to unite them with *P. amoena*, although it must be admitted that the line of demarcation between *P. eriophora* and *P. amoena* is not yet fully clear. The view that our plant represents a distinct species is supported by the fact that exactly the same plant was found outside Kamtchatka, namely at Ajan, collected by TILING and published in Fl. Ajan. (No. 225) as *P. amoena*.

The description of *P. eriophora* is somewhat unclear typographically, as it was begun as a note but continued as running text, and as the last two lines apparently refer to *P. longiflora*. I think, however, there can be no doubt about these facts, as it is the only species of this group in Kamtchatka and as TURCZANNINOV's specimen, which I have seen, is preserved in his herbarium.

Our species is extremely variable, especially in regard to its hairiness, but also in the size and form of the leaves. Specimens are found with only some few articulated hairs on the bracts, and others with stem bracts and calyx lanate with long hairs (the specimens from Avatcha volcano), as also all the intermediate forms between these extremes. The leaves of the higher-grown specimens (for instance HN No. 4018) are bipinnatifid, while those of small specimens are often only pinnatifid. They all differ, however, from *P. amoena*, especially in the structure of the bracts (best developed in the lowest whorl of flowers). These are large, practically palmate with 3—5 lobes and large, broad flattened basal part. Each lobe is then pinnatifid or often bipinnatifid, denticulated or crenate (cf. fig. 2 a—e). The bracts of the upper whorls, or in small specimens all of them, are often reduced, so that their lobes are inconspicuous. The outline of the leaves is more ovate than in *P. amoena*, the calyx teeth are longer, about equalling the calyx-tube, the upper and the lower lips are of about equal length (compare Pl. 1 fig. k, l) and all filaments are glabrous. The capsule is very broad, glabrous, about one and a half times as long as the calyx. The species is illustrated in Pl. 5 fig. d, e, f.

As I have not seen the specimen collected by STELLER »In Camtschatca et insulis Curilis» mentioned in the original diagnoses of *P. amoena*, I do not know whether STEVEN included our plant in his very heterogeneous *P. amoena*. It seems to me that the material now passing as *P. amoena* in Siberia should be divided into at least two different species. In the Altai specimens, for instance, the filaments of the two lower stamens are hairy at the base (and are so described by KRYLOF in Fl. Altaja IV p. 965), whereas they are described as glabrous in the diagnosis of *P. amoena*, and are actually glabrous in the arctic plant, which agrees with the specimen of the plant from lower Lena R. in Herb. ADAMS, which I have seen in Moscow, and which represents *P. amoena* ADAMS *sensu stricto*.

Type of distribution: ?Eastern Asiatic.

Geographical area: Only known from Kamtchatka and Ajan. The closely related *P. amoena* (sens. lat.) from arctic Russia and the Urals eastwards to Chukch Penins. and southwards to the W. Himalayas and Transbaikalia.



Fig. 2. a, b, c lower and upper bracts of *Pedicularis eriophora* from Kamtchatka; d, e lower and upper bracts of *Pedicularis amoena* from Balaganach, lower Lena R.

681. ***Pedicularis euphrasioides*** STEPH. in WILLD., Sp. pl. III (1800) p. 204.

CHAMISSO in Linnaea VI (1831) p. 590; ERMAN, Verzeichn. p. 59; STEVEN in Mém. Soc. Nat. Mosc. VI (1823) p. 42; BUNGE in LEDEB., Fl. Ross. III p. 284; HERDER, Pl. Radd. Monopet. No. 516 (257) in Bull. Mosc. 58: 2 (1883) p. 82 et RADDE, Reisen IV, 4 »Heft VI» p. 93; MAXIM. in Mél. Biol. X (1878) p. 112 et in Bull. Ac. Imp. Sc. St. Petersb. XXIV (1878) p. 74 et XXXII (1888) tab. IV fig. 136; KUDO, Fl. Paramush. p. 157; LIMPRICHT in FEDDE, Rep. Spec. Nov. XX (1924) p. 214. — *Pedicularis lapponica* BUNGE in LEDEB., Fl. Ross. III p. 281 quoad pl. ERMANII. — ?»*Pedicularis lutea*?» YABE & YENDO Fl. Shimushu p. (194).

Northern Kuriles: Paramushir KUDO 1920; ?Shumshu acc. to YABE & YENDO loc. cit. sub *P. lutea*.

South Kamtchatka: Cape Lopatka RIEDER 1831 (sub *P. ramosa*); N. of Ozernaja on the shore noted by HN; Javina noted by HN; N.E. of Javina noted in A. 95; between Javina and Kochegochek Aug. 14th 1921 HN No. 2870; between Kochegochek and the mouth of Golygina R. near the shore

noted in A. 102; between the arms of Kochegochek R. noted in A. 90 b; S. of Golygina village noted by Hn; N. of the mouth of Golygina R. noted by Hn; the divide between Savan and Shadutka rivers noted by Hn; Opala R. Rubinski 1909 (var. *simplex*); Assatcha mts. Aug. 9th 1922 Hn No. 4181; Opala volcano 1040 m. July 21st 1921 Hn No. 2333; N.W. of Opala volcano 300 m. July 18th 1921 Hn No. 2206; Lake Tolmachovaja 600 m. July 12th 1922 Hn No. 3893; upper Abshen R. noted by Hn; the mouth of Bolshaja R. July 5th 1921 Hn No. 1969 (var. *simplex*) A. 45, A. 51, A. 109 a; S. of Bolsheredsk noted by Hn; Bolsheredsk Vossnesensky 1847, do. S. of the river July 13th 1921 Hn No. 2132 (var. *simplex*); between Bolsheredsk and Apatcha Komarov 1908.

East Kamtchatka: Semjatchik July 1923 Malaise; Uzon Komarov 1909; Ustj-Kamtchatsk July 1925 Malaise No. 536.

Central Kamtchatka: Jelovka acc. to Erman loc. cit.

West and North Kamtchatka: Utka R. Rubinski (var. *simplex*); Tigil collector unknown »flore majore luteo, denticulis corolla minutis saepe obsoletis Tigil in Kamtschatka»» Hb. Turcz. (var. *simplex*); between Sedanka and Jelovka Erman (Hb. Acad. Petrop.) (the same locality as that cited as »Jelovka» in Erman loc. cit.?), do. specimen in Hb. Berol. with two labels viz. »*Pedicularis euphrasioides* Steph., Stev. in monogr. 6 p. 42 zwischen Sedanka and Jelovka Kschtka Westrand Ad Erman Chamisso hoch.» and »Videtur *P. lapponica* nec *P. euphrasioides* ab caules simplices et foliorum formam fid. Bunge»[1]; Pallan Savtchenko 1911; Karaginsk Island Mertens.

»Kamtchatka»: Collector unknown »Comm. Pallas»; Merk and Kegel acc. to Herder loc. cit., Stewart, Kusmischeff, Peters 1831; Collector unknown (sub *P. corymbosa*).

Noted in the following associations:

In *Carex—Rubus chamaemorus—Vaccinium—Empetrum* ass.:
Single (A. 45, A. 51, A. 109 a).
In *Vaccinium—Empetrum*—Moss ass.:
Single (A. 95).
In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 90 b, A. 102).

In South Kamtchatka *P. euphrasioides* occurs here and there in the *Sphagnum* bogs as well as on the heaths of the alpine region. It is especially common along the western coast. It flowers in July and the beginning of August.

P. euphrasioides is fairly variable. The specimens that differ most from

[1] The specimen is in fruit. The leaves of the spike are distinctly petiolated and have the crenulation reaching down to the base of the blade as in *P. euphrasioides*. In *P. lapponica* the blade of those leaves pass imperceptibly into the petioles, which are as broad as the blades. On this ground I have referred the specimen to *P. euphrasioides*.

the common arctic type of the species are the high-grown, often practically purple-flowered, specimens from the southern part of its Asiatic area (described by MAXIM. loc. cit.), which, acc. to KOMAROV, grow in the *Betula* and *Larix* forests there. This type, however, like most other specimens of this plant, is practically always strongly branched from the base. Some of the Kamtchatka plants differ remarkably from most other types in being unbranched, and as they also have thinner and more dissected leaves they may be regarded as a separate variety:

Var. ***simplex*** nov. var.

A typo differt: Annua, caule simplece, stricte erecta, foliis tenuioribus foliis caulinis pinnatifidis rachi angusto.

The most characteristic specimens of this variety are HN No. 2132 and that of RUBINSKI from Opala R. Specimens which I collected of this type were growing in *Sphagnum* bogs. Acc. to the label, RUBINSKI's specimens was also growing in a bog.

Type of distribution: Asiatic—American.

Geographical area: Asia: From the northern Urals eastwards to Chukch Penins., southwards at Obi to about 65° N. lat., at Yenisei to about 63° N. lat., to Transbaikalia, Amur prov., Saghalin and the southern Kuriles; also in the mts. about Lake Baikal, in the Sajan Mts. and in eastern Altai. America: from Alaska (Kotzebue Sound, Yukon valley, Kodiak Isl.) to Hudson Straits (Not reported from the arctic coast of Alaska nor from the Arctic Archipelago). W. Greenland.

682. ***Pedicularis lanata*** CHAM. & SCHLECHT. in Linnaea II (1827) p. 584 (non WILLD. ex CHAM. & SCHLECHT. loc. cit. p. 583).[1]

BUNGE in LEDEB., Fl. Ross. III p. 299; HERDER, Pl. Radd. Monopet. No. 535 (276) in Bull. Mosc. 58: 2 (1883) p. 106 et RADDE, Reisen IV: 4 »Heft VI» p. 117; MAXIM. in Mél. Biol. X (1878) p. 131; YABE & YENDO, Fl. Shimushu p. (193); KUDO, Fl. Paramush. p. 158.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka June 17th 1920 HN No. 28; Ozernaja BEZAIS (Hb. Berol.); Illina volcano 480 m. noted by HN; the northern Javina R. noted by HN; between the arms of Kochegochek R. noted in A. 90 b; N. of the mouth of Golygina R. in heath noted by HN; Cape Piratkof RIEDER 1831; Opala volcano 1040 m. July 21st 1921 HN No. 2339, do. July 23rd 1921 HN No. 2370; Lake Tolmachovaja July 13th 1922 HN No. 3933; Gorelaja volcano July 17th 1922 HN No. 3955 (A. 164); Mt. Taburett, Lake Natchika RUBINSKI 1909; »Mt Krasni gor» Lake Natchika KOMAROV 1908.

East Kamtchatka: Kichpinitch volcano KOMAROV 1909; Cape Kozlof

[1] Compare under *P. Langsdorffii*.

June 1923 MALAISE; the Kronoki Pass KOMAROV 1909; N.E. slope of Klutchevskaja volcano AFANASEJEV 1909; Klutchevskaja volcano Aug. 5th 1927 MALAISE.

Central Kamtchatka: Gremushej R. KOMAROV 1908; Korjatskaja volcano Aug. 14th 1928 W. EYERDAM; Ganalski Vystraki 2200 feet July 18th 1924 P. T. NOVOGRABLENOF; Anauna R. Aug. 19th 1926 MALAISE No. 369.

West and North Kamtchatka: Ustj-Tigil LEVITZKY; Karaginsk Island MERTENS, do. LOGINOVSKY 1910.

»Kamtchatka»: Collector unknown »Comm. PALLAS», KUSMISCHEFF, PETERS (Hb. Berol.).

Noted in the following associations:

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 90 b).
In *Vaccinium—Diapensia*—Lichen ass.:
Single (A. 164).

In South Kamtchatka *P. lanata* occurs here and there on the alpine, especially the high-alpine, heaths. It flowers in the beginning of June and has ripe seeds in the middle of July.

As already mentioned by MAXIMOWICZ loc. cit. p. 132, the leaves of the Kamtchatka specimens are more dissected than those of the arctic plant. For differences from *P. Langsdorffii* see under that species.

Type of distribution: Asiatic—American.

Geographical area: Europe: Spitzbergen, Nova Zembla, the northern Urals. Asia: along the North Coast to Chukch Penins., southwards to Vilju distr. and the northern Kuriles. America: from the north coast of Alaska, Melville Island and Ellesmereland, southwards (to the south in the mts.) to British Columbia and northern Labrador. W. Greenland between 66° 30′ N. lat. and about 76° N. lat.

683. ***Pedicularis Langsdorffii*** FISCH. ex STEVEN, Monogr. Pedicularis (1882) p. 49 tab. IX fig. 2 emend. CHAMISSO in Linnaea II (1827) pp. 583, 584.

BUNGE in LEDEB., Fl. Ross. III p. 288; MAXIM. in Mél. Biol. X (1878) p. 130; HERDER, Pl. Radd. Monopet. No. 534 (275) in Bull. Mosc. 58: 2 (1883) p. 104 et RADDE, Reisen IV: 4 p. 115; LIMPRICHT in FEDDE, Rep. Spec. XX (1924) p. 201.

West and North Kamtchatka: Karaginsk Island (Herb. LEDEB.); do. »misit BONGARD (Petropol.) 1837» (Hb. Holm.).

»Kamtchatka»: STELLER acc. to STEVEN loc. cit., ESCHSCHOLTZ sub *P. lanata* (Hb. Hort. Petrop.); »Petropavlovsk MERTENS» (Hb. Acad. Petrop.). *P. Langsdorffii* belongs to a group which is, as yet, comparatively unclear in its taxonomy. STEVEN divided the new species *P. Langsdorffii* described by

him into two parts, adding to the short original description the following lines »β calyce lanato: *P. alopecuroides* ADAMS. *P. lanata* PALL. herb. MARSCHALL et WILLDENOW».

CHAMISSO, loc. cit., to whom it was manifest that those two parts represented distinct species, reserved the name *P. Langsdorffii* for the plant of the northern Pacific shores and islands, which has since been known under that name, and identified (Linnaea II, 1827 p. 583) STEVENS' var. β with the common arctic plant, which has since been known as *P. lanata.* This identification, however, is hardly correct. STEVENS var. β (ADAMS' *P. alopecuroides*) is doubtless a plant from arctic Siberia which is much more closely allied to *P. Langsdorffii* than *P. lanata* is, and which was later described by TRAUTVETTER (Acta Horti Petrop. V, 1877 p. 93) as *P. lanata* var. *alopecuroides.* It is, as far as I can see, a distinct species.[1] The consequence of this reasoning might be that the latter plant should bear the name *P. lanata*, and it is certainly also the *P. lanata* of WILLDENOW, but as CHAMISSO on the next page has so well described his *P. lanata* that there can be no hesitation as to which plant is meant, I think the old and well-known name *P. lanata* can be retained, provided *P. lanata* CHAM. & SCHLECHT. in Linnaea II (1827) p. 584 is meant thereby and not *P. lanata* WILLD. loc. cit. p. 583.

[1] As the name *P. alopecuroides* ADAMS was only published as a synonym, it is not valid, and in order not to cause further confusion I do not use that name (compare below) for the plant which is described here, although it is most probably the plant ADAMS meant by *P. alopecuroides.*

P. Adamsii nov. spec. Pl. 5, fig. c.

Pedicularis Langsdorffii var. β STEVEN, Monogr. Pedicularis (1822) p. 49. — *Pedicularis alopecuroides* ADAMS in herb. saltem pro parte. — *Pedicularis condensata* d. SCHLECHT. p. in sched. WILLD. Herb. No. 11210 (non BIEB.). — *Pedicularis lanata* var. *alopecuroides* TRAUTV. in Acta Horti Petrop. V: 1 (1877) p. 93.

Herba perennis radice cf. multicephala crassa, caule (valido) 7—20 cm alto foliis basalibus pinnatisectis rachi angusto, laciniis angustis pinnatifidis vel subpinnatifidis. Spica lanata; flores bracteas serratas usque pinnatisectas petiolo lato superantes. Calyx lanatus 5-dentatus, dentibus lanceolatis integerrimis, dorsali ceteris multo minore. Corolla magna erecta circiter 3 cm longa, ut videtur pallide purpurascens, galea falcata parce lanata, sub apice denticulo parvo munita, labio trifido, lobo medio ceteris minore. Stamina longiora filamentis superne ciliatis. Stylus aliquantulum exsertus. Capsula compressa ovoidea vel fere semiglobosa, mucronata.

Differt a *P. Langsdorffii* rachi segmentisque foliorum angustis, spica calyceque lanatis, dentibus calycis diversa et capsula crassiore; a *P. lanata* recedit corolla majore et galea falcata et dente munita.

Through the courtesy of the botanical cabinet of the Moscow University I have been able to examine two sheets of *P. alopecuroides.* One of them (Hb. TRIN. No. 6575) labelled »*alopecuroides*. AD. Lena» contained two specimens, the right being *P. sudetica* WILLD. and the left *P. Adamsii;* the second (Hb. HOFFM. No. 4555) labelled »*Pedicularis alopecuroides* ad. fl. Lenam ADM.» was without flowers and too undeveloped for a definite determination.

The specimen in Hb. WILLD. (No. 11210) undoubtodly also belongs to *P. Adamsii,* but it is in fruit and only fragments of flowers are present. As all early material of our species is thus fragmentary, I regard the specimens collected by N. H. NILSSON-EHLE at Balaganash Lower Lena R. (71° 35′ N. lat.) (sub *P. lanata* var. *alopecuroides*) and preserved in the Riksmuseum, Stockholm, as the type of *P. Adamsii.*

There is, however, another point of uncertainty as regards the name *P. Langsdorffii*. In 1823 ROBERT BROWN published his *P. arctica*, which is considered to be identical with *P. Langsdorffii*, and SIMMONS in his Flora of Ellesmereland pp. 31—34 proposes to use that name instead of *P. Langsdorffii*, which he considered to be doubtful, owing to the fact that originally two species were included in it. To this it must be objected that *P. Langsdorffii* seems to be the older name, as the first plate (used as a title-page in the copies of STEVEN's work distributed by himself) bears the year 1822 and thus the separate copies were probably published as early as in 1822, whereas the paper did not appear in Bull. Soc. Nat. Mosc. until 1825. PFEIFFER (Treasur. Literat. Bot. p. 306) also gives 1822 as the year of publication of STEVEN's paper.

The identification of the Pacific *P. Langsdorffii* with the arctic plant described as *P. arctica* is also not clear. The arctic plant has smaller flowers, a longer, denser and more lanate spike, and a much more *P. hirsuta*-like habitus, than the Pacific plant. If it is united with *P. Langsdorffii* it must certainly be regarded at any rate as a geographical race of that species. The material at present available is, however, too small to allow of a proper judgment being formed on this question.

Type of distribution: ? Northern Pacific.

Geographical area: *P. Langsdorffii* (sensu stricto) Islands and shores of Bering Sea. *P. Adamsii* Taimyr Land (acc. to verbal information given by A. TOLMATCHEV), and lower Lena R. *P. arctica*: arctic shore of Alaska, the Arctic American Archipelago, N.W. Greenland. To which form the plant from Viljuj distr. and Kolyma belongs I do not know.

684. ***Pedicularis lapponica*** L. Sp. pl. ed. 1 (1753) p. 609.

CHAMISSO in Linnaea II (1827) p. 583; STEVEN in Linnæa, Fl. Ross. III p. 251 pro maxima parte; HOOKER, Fl. Bald. Memoper. No. 312 (283) in Bull. Mosc. 58: 2 (1883) p. 77 et KNORR, Reisen IV. 4 (Heft VI) p. 88. MAXIM. in Mél. Biol. X (1878) p. 105.

West and North Kamtchatka. Krutogorovaja Bezats 1909.

(Kamtchatka:) Petropavlovsk May 22nd 1910 GURYANOV. (Probably Petropavlovsk district, not the town, is meant.)

All the above-enumerated reports of *P. lapponica* from Kamtchatka were founded on specimens (in Hb. Hort. Petrop. and Hb. Bonn.) collected by RUPRECHT, who never visited our area. The species was thus not known earlier from the Kamtchatka Peninsula. (Compare under *P. euphrasioides*.)

Type of distribution: Circumpolar.

Geographical area: Europe: the Scandinavian mts., Kola penins., arctic Russia with Kolgujef and Nova Zemlja, in the Urals southwards to northernmost Perm. Asia: along the coast to Chukch Penins., southwards to Dahuria, Udskoj distr., northern Saghalin and W. Kamtchatka. America: arctic N. America (Coronation Gulf, Baffin Land, Labrador), E. and W. Greenland.

Pedicularis nasuta M. à Klok. ex Steven, Monogr. Pedicularis (1822) p. 43 tab. XV fig. 1 et in Mém. Soc. Nat. Mosc. VI (1823), p. 43.

Ledeb. in Ledeb., Fl. Ross. III p. 279; Herder, Pl. Radd. Monopet. No. 515 (256 in Bull. Mosc. 58 2 1883 p. 81 et Trudy, Tomsk IV 4 «Heft VI» p. 82; Maxim. in Mél. biol. X (1881) p. 111; Limpr. in Pfeiff., Rep. Spec. Nov. 20 (1924), p. 216.

The species was recorded by Steven as having been collected «in insulis archipelagi Camtschatcae». By this he probably meant the neighbourhood of Bering Straits as even the Chukch Peninsula is regarded as part of the «Kamtschatka Provincia» and no archipelago can be said to exist around the Kamtschatka Peninsula. Furthermore the only specimens that I have seen which coincide with Steven's figure were from northern Alaska. It seems doubtful, however, whether the species can be distinguished specifically from *P. sudetica*.

(65). ***Pedicularis Oederi*** Vahl in Hornem. Forsog til Dansk oeconom. Plantel. I ed. II (1806) p. 580.

Kuso, Fl. Paramush. p. 157. — *Pedicularis arctoa* Wahlenb., Veg. Helvet. (1813) p. 116; Steven, Monogr. Pedicularis p. 52; Ledeb., Fl. Ross. III p. 300; Herder, Pl. Radd. Monopet. No. 537 (278) in Bull. Mosc. 58 2 (1883) p. 108 et Ledeb., Ross. IV 4 «Heft VI» p. 110; Maxim. in Bull. Ac. Imp. Sc. St. Petersb. XXIV (1878) p. 82 et XXXII (1888) p. 133 tab. VII fig. 177 a, b; Yabe & Yendo, Fl. Shimushu p. (193).

Northern Kuriles: Paramushir M. Aizava 1900 acc. to Kuso loc. cit., Kuso 1920, Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka Rinder 1831, do. June 17th 1920 Hs. No. 33, do. June 20th 1920 Hs. No. 104, do. June 24th 1920 Hs. No. 152, at «Degebnag» Golygina R. Rinderi 1909 Hb. Acad. Petrop. the both specimens to the left; Shaborka volcano 1125 m. Aug. 2nd 1921 Hs. No. 2006; Asacha mts. at the sources of Opala R. July 31st 1922 Hs. No. 3569; Lake Tolmachevaja 800 m. July 11th 1922 Hs. No. 3887, do. July 13th 1922 Hs. No. 3913; Shalaun Vosnessensky 1848.

East Kamtchatka: Shipunski Rinder 1831 and acc. to Herder loc. cit. Dubrik 1852, the Krenoki Pass Komarov 1908, Klutchevskaja volcano Bazare 1908, do. N.E. slope Arsamasov 1909, do. Aug. 6th 1927 Malaise; Ploskaja volcano «pervaja na dole sopochka» Pavlovsrov 1909.

Central Kamtchatka: Sources of Ozernaja R. Komarov 1908, the foot of Koriakskaja volcano Komarov 1908, Hb. Holm; Ganala Stewart mts., Ganalski Yurtaski July 16th 1924 P. T. Nottingham; the sources of Kashkan R. Komarov 1908, Anadina R. August 1st 1926 Malaise No. 370, do. Sept. 1st 1926 Malaise No. 364.

West and North Kamtchatka: Tigil Hr. Trautv., between sedanka and Jelovka Bazare 1908, Karaginsk Island Lutkevitsch 1910.

«Kamtschatka» Erman-Chamisso-Kittlitz (Hb. Berol.), «Petropaulowsk Merten», Peters.

In South Kamtchatka *P. Oederi* is rare, and was only seen in the above-enumerated places in the alpine region. It flowers from the middle of June to the end of July.

As Maximowicz had already observed (Comp. Maxim. loc. cit.), Kamtchatka specimens are not exactly identical with European. The flowers are larger, with longer upper lip and shorter and broader tube (usually reaching about to the top of the calyx-teeth). The calyx-teeth (except the short dorsal one) are long and end with a large leaf-like, pilose brim, which is much less developed in the European plant. These characteristics are especially remarkable in the specimens from southern Kamtchatka, but it does not seem possible to draw any strict line of demarcation between it and the European type. *P. Oederi* is therefore here taken in its wide sense, although further study of a large body of material may possibly provide evidence to prove that the Eastern Asiatic plant should be regarded as a separate variety or subspecies.

Type of distribution: Eurasiatic.

Geographical area: Europe: mts. of Central Scandinavia, the Alps, the Carpathians, the eastern part of Samoyede Land, the Urals, southwards to Orenburg, Nova Zembla. Asia: along the North Coast to Chukch Penins. southwards in the mts. to Kashmir, Szech'uan, Transbaikalia, Ajan and the northern Kuriles; also in Yezo (reported by Koidzumi in Bot. Mag., Tokyo 31 (1917) p. 34 for mt. Nutakkamshipe on Yezo, but not named in connection with that island by Kudo in Jap. Journ. Bot. II (1925) p. 277). America: St. Lawrence Island, Kotzebue Sound.

686. ***Pedicularis resupinata*** L., Sp. pl. ed. I (1753) p. 608.

Chamisso in Linnaea VI (1831) p. 590; Erman, Verzeichn. p. 59; Bunge in Ledeb., Fl. Ross. III p. 281; Herder, Pl. Radd. Monopet. No. 513 (254) in Bull. Mosc. 58: 2 (1883) p. 79; Maxim. in Mél. Biol. X (1878) p. 106; Yabe & Yendo, Fl. Shimushu p. (193); Kudo, Fl. Paramush. p. 156; Limpr. in Fedde, Rep. Spec. Nov. XX (1924) p. 237.

Northern Kuriles: Paramushir C. Taro 1894 and T. Matsubara 1915 acc. to Kudo loc. cit., Kudo 1928; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: S. of Kambolnoje R. Rubinski 1909 (sub *P. teucrifolia*); Kurile Lake noted by Hn; lower Ozernaja R. noted in A. 96; Ozernaja (= Oxernoj) Hb. Sapporo, do. noted by Hn; between Javina and Kochegochek noted in A. 91, A. 92; lower Kochegochek R. (f. flor. albis) noted by Hn; S. of Kochegochek noted by Hn; Sahach noted in meadow by Hn; upper Kusingen R. noted in A. 190; S. of Golygina noted by Hn; upper Ksudach R. noted in A. 83; middle Ksudach R. noted by Hn; N. of the mouth of Golygina R. noted by Hn; the northern Shadutka R. in meadow noted by Hn; Lake Sterbot noted by Hn; Topik noted by Hn; the N.W. slope of Assatcha mts. up to 460 m. noted by Hn; upper Opala R. noted in A. 184, A. 185; near the hot springs at upper Opala R. noted in A. 180, A. 182; upper Udoshk R. noted in A. 78 b; W. of Opala volcano noted in A. 67, A. 78 a; upper Abshen R. noted by Hn; the junction of Tolmachovaja rivers noted in

A. 157; lower Bolsjaja R. noted in A. 105, A. 107; near the mouth of Balaganchik R. noted in A. 152, A. 153; middle Karymchina R. in meadow noted by Hn; lower Karymchina R. noted in A. 124, A. 151; Agashka R. noted in A. 62, A. 63, A. 64; Bolsheredsk Rubinski 1908; between Bolsheredsk and Apatcha noted in A. 113; lower Bannaja R. in *Angelica ursina* meadow noted by Hn; Siku R. noted in A. 122; Paratunka Stubendorff, do. Savitch 1908; between Paratunka and Mikisha Komarov 1908; Lake Blishne Komarov 1908; mt. Saraj, Shalsan Komarov 1908; Uzdets R. Komarov 1908; mt. Tshapochka Komarov 1908; mt. Zerkalo, Natchika noted in A. 114 and A. 119; the hot springs at Natchika Vossnesensky 1847; Savoiko Komarov 1908 (Hb. Berol.), do. June 10th, 20th and 26th 1928 W. Eyerdam (also f. flor. albis).

East Kamtchatka: The entrance of Avatcha Bay Perfiljef 1911 (sub *P. teucrifolia*); Petropavlovsk Stewart, do. Vossnesensky 1841 (also f. flor. albis), do. Dobrotvorsky, do. Perfiljef 1910 (also f. flor. albis), do. July 19th 1920 Hn No. 512, do. 165 m. July 29th 1920 Hn No. 568, do. Aug. 16th 1920 Hn No. 894 (A. 7 a, A. 9); Kalashtyrka Perfiljef 1910; between Petropavlovsk and Savoiko July 9th 1920 Hn No. 375; between Petropavlovsk and Avatcha volcano noted in A. 18, A. 23, A. 42, A. 43; Shupanova R. Ditmar 1852; Ustj-Kamtchatsk Bezais 1908, do. July 15th 1925 Malaise No. 534.

Central Kamtchatka: Malka Stubendorff; Shtchapina Komarov 1909, do. Grinop 1909, do. July 27th 1921 Hn No. 3489 (Malaise); Kunchekla Grinop 1909; Klutchi Bezais 1908 (Hb. Berol.); do. Afanasejev 1909.

West and North Kamtchatka: Kompakovaja Zelenin 1908; Krutugorovaja Zelenin 1908, do. Protopopof 1909; Tigil »Kiesinseln des Tigilflusses Ad Erman Chamisso», do. Hb. Turcz., do. Levitzky 1848, do. Gudzenko 1910; Pallan Savtchenko 1911.

»Kamtchatka»: Merk, Eschscholtz, Rastargujeff, Stewart, Kusmischeff, »Petropavlovsk Mertens», Peters, »Rieder Kamt. ad Erman» (Hb. Berol.), »Rieder & Stewart» (Hb. Berol.).

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 67, A. 78 b, A. 83, A. 91, A. 92, A. 96, A. 105, A. 107, A. 114, A. 119, A. 153, A. 182, A. 184, A. 185, A. 190).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 113, A. 122, A. 124, A. 151).

In *Betula platyphylla—Thalictrum—Carex* ass.:
Single (A. 152, A. 157).

In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 7, A. 23, A. 42, A. 43); Sparse (A. 9, A. 18).

In *Betula Ermani—Filipendula—Dryopteris* ass.:
Single (A. 62, A. 63, A. 64, A. 180).

In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Single (A. 78 a).

In South Kamtchatka *P. resupinata* is very common, constantly occurring in all the meadows and *Betula* forests of the country from sea-level up to their altitudinal limit. It even occurs sometimes, although rarely, in the meadows of the lower alpine region. In the lowlands it occasionally occurs also in plant communities of a wetter type than the meadows and *Betula* forests.

On the whole the material of this plant from our area is very uniform and only some few of the specimens show any wide variations from the common type. Specimens belonging to var. *oppositifolia* Miq. were not observed. The specimen of Rubinski from S. of Kambolnaja R. differs in having a more puberulent calyx than is usually the case. It may be regarded as var. *pubescens* Kom. Some other specimens resemble this type. I cannot find that it is possible to distinguish any of the specimens specifically as *P. teucrifolia* M. a Bieb. Specimens with white flowers occur here and there. *P. resupinata* flowers in July and August.

Type of distribution: Siberian.

Geographical area: Europe: The eastern parts of Perm, Ufa and Orenburg provinces. Asia: throughout Siberia, at Yenisei from about 61° N. lat., from Verchojansk and Gishiginsk districts and northern Kamtchatka, southwards to southern Tobolsk and Tomsk provinces, southern Mongolia, Kansu, Hu-peh, Shantung, Corea and southern Japan. In America: the somewhat similar yellow-flowered *P. lanceolata* Michx.

687. ***Pedicularis Rubinskii*** Komarov in Fedde, Rep. Spec. Nov. XIII (1914) p. 236.

South Kamtchatka: The mouth of Bolshaja R. Rubinski 1908 (Hb. Acad. Petrop., type specimen of the species), do. July 4th 1921 Hn No. 1954, do. July 5th 1921 Hn No. 1999; Bolsheredsk, S. of the river July 13th 1921 Hn No. 2130; near Nikolajevsk Komarov 1908 (Hb. Berol.) (sub *P. sphagnicola*); Lake Vershne, Avatcha R. Ramenski 1908 (sub *P. sphagnicola*).

East Kamtchatka: Kalashtyrka Perfiljef 1910 (sub *P. sphagnicola*).

Central Kamtchatka: Korjatskaja volcano Aug. 13th 1928 W. Eyerdam; Kirganik Komarov 1908 (sub *P. sphagnicola*).

This plant is apparently rare in Kamtchatka. As regards habitus it varies a good deal. Those designated by Komarov as *P. sphagnicola* seem to me to be the autumnal form with prolonged spike and somewhat smaller flowers, while the type represented by the specimens from the mouth of Bolshaja river seem to be the spring form. Similar seasonal dimorfisms occur also within other species of this group.

P. Rubinskii is certainly very closely allied to *P. adunca*, but I must leave the question of its relationship to that species open as I have only seen one

collection undoubtedly belonging to *P. adunca*, viz. that from Ajan collected by TILING, and thus can have no idea as to the degree of variation within the species. The Kamtchatka plant differs from those specimens of *P. adunca* chiefly in having the two calyx-lobes entire in the margin (only in some few cases with any trace of a denticulation) and in having somewhat shorter calyx and larger flowers. (*P. adunca* has denticulated calyx-lobes (Comp. MAXIM. in Bull. Ac. Imp. Sc. St. Petersb. XXXII 1888 tab. IV fig. 138), longer calyx and smaller flowers.)

Type of distribution: ?

Geographical area: Only known from our area. The closely related *P. adunca* on the western shore of the Ochotsk sea.

688. ***Pedicularis sudetica*** WILLD., Sp. Pl. III (1800) p. 209.

STEVEN in Mém. Soc. Nat. Mosc. VI (1823) p. 44 tab. XV fig. 2; BUNGE in LEDEB., Fl. Ross. III p. 286; HERDER, Pl. Radd. Monopet. No. 521 (262) in Bull. Mosc. 58: 2 (1883) p. 89 et RADDE, Reisen IV: 4 »Heft VI» p. 100; MAXIM. in Mél. Biol. X (1878) p. 116; FEDTSCH., Fl. Îl. Comm. p. 97 (var. *lanata*); KUDO, Fl. Paramush. p. 157; LIMPR. in FEDDE, Rep. Spec. Nov. 20 (1924) p. 216.

Northern Kuriles: Paramushir KUDO 1920.

South Kamtchatka: Akhomten Bay Aug. 30th 1920 HN No. 1174 (MALAISE), do. Sept. 10th 1920 HN No. 1242, do. 250 m. Sept. 11th 1920 HN No. 1321; Mutnovskaja volcano 800 m. July 27th 1922 HN No. 4016, do. July 28th 1922 HN No. 4043, do. up to 1460 m. noted by HN; Gorelaja volcano 800 m. July 14th 1922 HN No. 3951.

East Kamtchatka: The Kronoki Pass KOMAROV 1909.

Commander Islands: Bering Island DYBOVSKY, GREBNITZKY and STEJNEGER all acc. to FEDTSCH. loc. cit. (var. *lanata*); Copper Island MOROZEWICZ acc. to FEDTSCH. loc. cit. (var. *lanata*).

»Kamtchatka»: STELLER acc. to STEVEN loc. cit.; »Petropavlovsk MERTENS»; CHAMISSO & ESCHSCHOLTZ acc. to HERDER loc. cit.; RIEDER 1831.

In South Kamtchatka *P. sudetica* is common within a small strictly limited area around the Mutnovskaja volcano, but was not observed outside that area. It flowers in July. At the beginning of the floration the spike is short and practically capitate (var. *gymnocephala* TRAUTV.), but in time it becomes more and more elongated (var. *gymnostachya* TRAUTV.) and fruit-specimens usually have a comparatively long spike.

Type of distribution: Eurasiatic, transgressing into Western America.

Geographical area: Europe: The Sudetes and the Giant Mts. and from E. Kola Penins. eastwards to Kolgujef and the northern island of Nova Zembla and to the northern Perm prov. in the Urals. Asia: along the coast to Chukch Penins., southwards at Yenisei to about the Arctic Circle, to Vilju distr., Ochotsk distr., northern Saghalin and the northern Kuriles. Also at the sources of Uda R. America: Islands in the Bering Sea, from the north coast

of Alaska and the southern part of the Arctic Archipelago eastwards to Melville Penins. and Southampton Island.

Pedicularis tristis L.

STEV., Monogr. Pedicularis in Mém. Soc. Nat. Mosc. VI (1823) p. 57; BUNGE in LEDEB., Fl. Ross. III p. 302; LIMPR. in FEDDE, Rep. Spec. Nov. XX (1924) p. 227.

All records of this species from Kamtchatka are founded on STEVEN's report, which reads: »trans Lenam in Camtschatca (Steller)». The specimen is still to be found in Hb. Acad. Petrop. labelled »Ex Sibiria Comm. PALLAS *Pedicularis macrocarpos* e Kamtschatca florens». In this case apparently by »Kamtchatka» was meant the Kamtchatka province and not the peninsula. Compare HULTÉN, Fl. Kamtch. I p. 6.

The species should be excluded from the flora of our area.

Pedicularis venusta SCHANGIN.

LEDEB., Fl. Ross. III p. 293; HERDER, Pl. Radd. Monopet. No. 525 (266) in Bull. Mosc. 58: 2 (1883) p. 93 et RADDE, Reisen IV: 4 »Heft VI» p. 104; LIMPR. in FEDDE, Rep. Spec. Nov. XX (1924) p. 218.

LEDEBOUR's record, which is the source of later reports of this species from Kamtchatka, reads: ». . . in Kamtchatka (Hbr. acad. Petr.)». This specimen is still to be found there, provided with three labels, viz.: »*Pedicularis* an laciniatae varietas? Ex Kamtschatka Comm. PALLAS», »*Ped. comosae* affinis Kamtschatka» and »*P. venusta* SCHANG. var. *parviflora*». In Hb. Berol. there is also a specimen with two labels reading: »*P. comosa* var. *achilleifolia* W. e plantis Kamtschaticis REDOWSKII, CHAMISSO» and »*P. venusta* SCHANG. v. *kamtschatica* fide BUNGE». In both cases probably the Kamtchatka province and not the Kamtchatka peninsula is meant; in the latter case this is certain, as REDOWSKY never visited the Peninsula. The species is not known to occur within our area, although it was reported from »the northern Kuriles» by KUDO (KUDO 1925) and also occurs north of it at Kolyma.

689. ***Pedicularis verticillata*** L., Sp. pl. ed. I (1753) p. 608.

PENNANT, Arct. Zool. (1784) p. CXVI; GEORGI, Beschreib. III: 5 p. 73; BUNGE in LEDEB., Fl. Ross. III p. 270; HERDER, Pl. Radd. Monopet. No. 506 (247) in Bull. Mosc. 58: 2 (1883) p. 70 et RADDE, Reisen IV: 4 »Heft VI» p. 81; MAXIM. in Mél. Biol. X (1878) p. 95.

South Kamtchatka: Between Lopatka and Javina RIEDER 1831; N. of Ozernaja at the sea-shore noted by HN; Kochegochek Sept. 9th 1922 HN No. 4552 (A. 213); Golygina R. 25 verst above the village RUBINSKI 1909; »Tundra ad fl. Goligin» VOSSNESENSKY; Golygina village Aug. 8th 1921 HN No. 2755; N. of the mouth of Opala R. noted in A. 214; Shadutka volcano 1125 m. Aug. 2nd 1921 HN No. 2599; Gorelaja volcano 900 m. July 20th 1922 HN No. 3963; the mouth of Balaganchik R. July 7th 1922 HN No. 3874; mt. »Seloni gor», Lake Natchika KOMAROV 1908; mt. Saraj, Shalsan R. KOMAROV 1908; Natchika STEWART (acc. to the label f. flor. albis), do. VOSSNESENSKY

1848; Mt. Tshapotchka, Natchika Komarov 1908; mt. Palovinaja 600 m. July 8th 1920 Hn No. 325 (var. *latisecta*), do. July 22nd 1928 Malaise, do. Aug. 1st 1928 W. Eyerdam (var. *latisecta*); Poperochnaja R. Komarov 1908 (var. *latisecta*); Olchovaja R., Korjatskaja valley Komarov 1908.

East Kamtchatka: Avatcha volcano Perfiljef 1911, do. 900 m. Aug. 30th 1920 Hn No. 629; Cape Kozlof June 20th—30th 1923 Malaise; Lake Kronoki Komarov 1909; the Kronoki Pass Komarov 1909; Klutchevskaja volcano 3600 feet Bezais 1908, do. N.E. slope Afanasejev 1909, do. Kozlovski 1909 (Hb. Berol.); Lake Assabatch Aug. 10th 1925 Malaise No. 537; Ustj-Kamtchatsk July 30th 1925 Malaise No. 538.

Central Kamtchatka: Between Natchika and Malka Stewart; Malka Komarov 1909; Lake Ovalni, Korjatskaja volcano Komarov 1908 (Hb. Holm.); Korjatskaja volcano Aug. 14th 1928 W. Eyerdam; Ganala Komarov 1909 (Hb. Berol.); Ganalski Vaktal R. Protopopof 1908; between Ganala and Pushtchina Grinop 1909; Kamtchatka Vershina Komarov 1909; the sources of Kashkan R. Komarov 1909; between Shtchapina and Kronoki Aug. 30th 1921 Hn No. 3528 (Malaise, var. *latisecta*); Anauna R. Aug. 19th 1926 Malaise No. 363, do. Aug. 29th 1926 Malaise No. 365, do. Sept. 5th 1926 Malaise No. 367; »Ad margines Fl. Kamtschatka» Aug. 30th 1846 Vossnesensky.

West and North Kamtchatka: Kompakovaja Zelenin 1908; Krutugorovaja Bezais 1909; between Sedanka and Jelovka Bezais 1909, do. Aug. 20th 1927 Vavilin (Hb. Holm.); Tigil Levitzky 1848; Pallan Savtchenko 1911; Karaginsk Island Mertens.

»Kamtchatka»: Eschscholtz and Kusmischeff acc. to Herder loc. cit., »Petropavlovsk Mertens», Peters.

Noted in the following associations:

In *Vaccinium—Empetrum*—Moss ass.:
Single (A. 214).

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 213).

In South Kamtchatka *P. verticillata* is fairly common in the heaths of the alpine region. It flowers in July and August.

As already pointed out by Maximowicz (Bull. Ac. Imp. Sc. St. Petersb. 32 (1888) p. 600), most asiatic specimens are higher-grown than the European. Otherwise they agree fairly well.

Some of our specimens, however, differ not only in being unusually high-grown but also in having pinnatifid leaves, large pinnatifid bracts, long internodes and the whorls (at least the lowest) very distant from each other. In habitus this form very closely resembles *P. refracta* Maxim., in Bull. Acad. Petrop. XXVII (1880) p. 517, but in the veins of the calyx, the length of the filaments and its upward-turned capsules, it agrees with *P. verticillata* and not with that species. It might be regarded as a separate variety var. *latisecta*.

Type of distribution: Eurasiatic, transgressing into Western America.

Geographical area: Europe: N. Kola Penins., Kolgujef and the arctic Russian mainland, southwards in the Urals to Ufa. The Central European mts. southwards to Sierra Nevada, the Apennines and the northern Balkans. Asia: along the arctic coast to Chukch Penins., southwards in the high mts. to northern Tibet, Szech'uan and southern Japan. America: Islands in Bering Sea, N. Alaska (Kotzebue Sound, Herschel Isl.) southwards to Sitka.

Orobanchaceae LINDL.

690. ***Boschniakia rossica*** (CHAM. & SCHLECHT.) nov. comb.

Orobanche rossica CHAM. & SCHLECHT. in Linnaea IV (1828) p. 132. — *Boschniakia glabra* C. A. MEY. in BONG., Veg. Sitcha, Mém. Ac. Imp. Sc. St. Petersb. Ser. VI Sc. Mat. II (1833) p. 159; LEDEB., Fl. Ross. III p. 323; HERDER, Pl. Radd. Monopet. No. 543 (284) in Bull. Mosc. 59: 1 (1884) p. 237 et RADDE, Reisen IV: 5 p. 7; KUDO, Fl. Paramush. p. 158; KOM., Voy. Kamtch. p. 451. — »eine *Orobanche*» MERTENS, Bemerk. Fl. Koragins p. 64.

Northern Kuriles: Paramushir KUDO 1920.

South Kamtchatka: Cape Lopatka RIEDER 1831; »Shikshevaja tundra» Ozernaja R. RUBINSKI 1909; near the upper waterfall in Unkanakchek R. noted by HN; »mt. Dogshinag», Golygina R. RUBINSKI 1908; Akhomten Bay Sept. 10th 1920 HN No. 1270; Opala volcano 1040 m. July 21st 1921 HN No. 2310; sources of Poperochnaja R. KOMAROV 1908; mt. Palovinaja 800 m., Savoiko, July 8th 1920 HN No. 299.

East Kamtchatka: Petropavlovsk noted by HN; between Petropavlovsk and Avatcha volcano 300 m. Aug. 15th 1920 HN No. 769 a; Avatcha volcano 300 m. noted by HN; the northern foot of Kichpinitch volcano KOMAROV 1909 (Hb. Berol.); Lake Kronoki 900 m. Sept. 12th 1921 HN No. 3585 (MALAISE); Stolbovoj R., Klutchevskaja 3500 feet, AFANASEJEV 1909; Klutchevskaja volcano 4900 feet KOZLOVSKI 1909.

Central Kamtchatka: Korjatskaja volcano Aug. 12th 1928 W. EYERDAM; mt. Aak KOMAROV 1908.

West and North Kamtchatka: The mouth of Itcha R. BJELOUSSOF 1914; Karaginsk Island acc. to MERTENS loc. cit.

»Kamtchatka»: Collector unknown, probably STELLER, »Kamtschadalis *Uktschutsch* ad Lenam et in Kamtschatka (PALLAS)» (Hb. Berol.).

In South Kamtchatka *B. rossica* occurs here and there. It is confined to the *Alnus fruticosa* region, as it is parasitic on the roots of that shrub. It flowers in July.

Descriptions of this plant in different works often do not tally. It may be remarked that the calyx has four teeth, the dorsal and ventral being small (the dorsal sometimes even insignificant), while the two lateral ones

are much longer, and that the upper lip is entire. In dry material the calyx and the corolla are very brittle, and it is therefore sometimes difficult to get a clear idea of their form when only herbarium-material is available.

Type of distribution: Asiatic—Western American.

Geographical area: Asia: from the northern Urals and the mouth of Yenisei R. eastwards to Chukch Penins., southwards to Vilju distr., the Sajan mts. (acc. to KOM. in Fl. Mansh.), Dahuria, northern Amur prov., Saghalin and Honshu. America: from Kotzebue Sound to the Great Slave Lake, southwards to the Aleutian Islands and Sitka. This area coincides well with that of its host — *Alnus fruticosa*. Compare under that species.

Lentibulariaceae LINDL.

Pinguicula alpina L.

MERTENS, Bemerk. Fl. Koragins p. 65.

P. alpina is an Eurasiatic plant occurring eastwards at least to lower Lena and Jakutsk distr. Thus, it might well occur on Karaginsk Island, as MERTENS reports, but as it is possible that he has mistaken a *P. variegata* or some other *Pinguicula* species for *P. alpina* I think that the report is in need of confirmation.

691. ***Pinguicula villosa*** L., Sp. pl. ed. I (1753) p. 17.

South Kamtchatka: Golygina R. 15 verst from the mouth RUBINSKI 1909; near the mouth of Bolshaja R. July 4th 1921 HN No. 1942, do. July 5th 1921 HN No. 2000; near the mouth of Ipelka R. noted by HN.

West and North Kamtchatka: Krutugorovaja BEZAIS 1909.

In Kamtchatka this pretty little plant was only observed in the *Sphagnum* bogs, which form a belt along the western coast. The species is certainly often overlooked and its geographical area is difficult to state.

Type of distribution: Circumpolar.

Geographical area: Known to me from northern Scandinavia (from northern Dalecarlia northwards), northern Finland and Kola penins., the northern Urals (Tobolsk prov., Berezovsk distr. GORODKOF 1917!), lower Yenisei and Lena, Yakutsk distr. (acc. to KOM.), sources of Bureja R. (acc. to FR. SCHM.) and W. Kamtchatka, and in America from Port Clarence, Norton Sound, Chamisso Island, Unalashka and (acc. to LEDEB.) Sitka, also reported from »Hudson Bay» and »Labrador» (A. GRAY).

692. ***Pinguicula vulgaris*** L., Sp. pl. ed. I (1753) p. 17.

YABE & YENDO, Fl. Shimushu p. (193). — *Pinguicula camtschatica* PALL. ex LINK, Jahrb. I: 3 (1820) p. 54 (not seen). — *Pinguicula macroceras* LEDEB., Fl. Ross. III p. 3. — *Pinguicula microceras* HERDER, Pl. Radd. Monopet. No. 69 in Acta Horti Petrop. I: 2 (1872) p. 381 et RADDE, Reisen IV: 1 p. 99 saltem quoad pl. Kamtsch.; KOM. in herb. quoad pl. Kamtsch. — *Pinguicula vulgaris* var. *macroceras* KUDO, Fl. Paramush. p. 159.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka noted by HN; between Javina and Kochegochek RUBINSKI 1909 (flowering Aug. 13th); sources of Kidipalok R. 800 m. Sept. 3rd 1922 HN No. 4460; between Golygina village and Kochegochek R. Aug. 9th 1921 HN No. 2775.

»Kamtchatka»: PETERS 1831, RIEDER 1831.

This plant seems to be confined to the southwestern part of our area. It is with some hesitation that I refer it to *P. vulgaris* as the material of well developed specimens is very small. I myself never saw the plant in flower in Kamtchatka. Some of the specimens of RUBINSKI have a very thin and comparatively short spur and were therefore referred to *P. microceras* CHAM. & SCHLECHT. by KOMAROV. As the size of the spur varies considerably in European and American material of *P. vulgaris*, and as I could not find any other constant characteristic distinguishing the Kamtchatka plant from *P. vulgaris*, I have referred it to that species, although to judge from the very peculiar geographical area one might expect that the material now referred to *P. vulgaris* ought to be divided into different systematical units. The spur of the specimens from Unalashka on which *P. microceras* was founded is still considerably shorter than that of those Kamtchatka specimens which have the smallest spur.

Type of distribution: ?

Geographical area: (In several forms, area often not confluent) Europe: from Iceland, northernmost Scandinavia, Kola peninsula and the arctic Russian mainland, southwards in the mts. to Spain, northern Italy, Transsylvania, Volynia, Moskovsk, Vologda and Perm provinces. Asia: Sajan Mts. and mts. around Lake Baikal, S.W. Kamtchatka, the Kuriles, mts. on Yezo and Honshu. America: from the Aleutian Islands and the Arctic Coast (Port Epworth, Coronation Gulf) to Labrador (59° N. lat.) southwards to Washington (47° N. lat.) and New Hampshire (44° N. lat.). E. and W. Greenland (to about 71° N. lat.).

693. ***Utricularia intermedia*** HAYNE in SCHRAD., Journ. Bot. (1800) I p. 18 tab. 5.

HERDER, Pl. Radd. Monopet. No. 67 in Acta Horti Petrop. I: 2 (1872) p. 376 et RADDE, Reisen IV: 1 p. 94; KUDO, Fl. Paramush. p. 159.

Northern Kuriles: Paramushir KUDO 1920 acc. to KUDO loc. cit.

South Kamtchatka: Cape Lopatka RIEDER 1831; middle Ksudach R. Aug. 6th 1921 HN No. 2700; near the mouth of Bolchaja R. July 5th 1921 HN No. 1998; the Paratunka »tundra» KOMAROV 1908; Savoiko Aug. 3rd 1928 W. EYERDAM.

East Kamtchatka: Between Petropavlovsk and Avatcha volcano 250 m. Aug. 28th 1920 HN No. 1085; the fourth Kronoki R. KOMAROV 1909.

Central Kamtchatka: Mashura KOMAROV 1909.

In South Kamtchatka *U. intermedia* is not common.

Type of distribution: Circumpolar.

Geographical area: Europe: from northern Scandinavia and Perm prov., southwards to France, Italy and southern Russia. Asia throughout Siberia to Kamtchatka, Japan and Corea. America: from British Columbia to Newfoundland, southwards to California, the Great Lake region and New Jersey. Isolated localities in W. Greenland. A map of the Eastern American distribution is given by FERNALD in Mem. Gray. Herb. II p. 319.

694. ***Utricularia minor*** L., Sp. pl. ed. I (1753) p. 18.

South Kamtchatka: The hot springs at Unkanakchek Aug. 19th 1922 HN No. 4313; Lake Natchika RAMENSKI 1908; the hot springs on mt. Zerkalo, Natchika, KOMAROV 1908.

This species is apparently rare in Kamtchatka.

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland, northernmost Scandinavia and Perm prov., southwards to Spain, Italy and southern Russia. Asia: throughout Siberia to Kamtchatka and Yezo, southwards to Semipalatinsk prov. and Sinkiang (Lob nor). America: from British Columbia to Quebec, southwards to California, Utah and New Jersey. W. Greenland.

695. ***Utricularia vulgaris*** L., Sp. pl. ed. I (1753) p. 18.

KOM., Voy. Kamtch. p. 244.

East Kamtchatka: The delta of Avatcha R. RAMENSKI 1908.

Central Kamtchatka: Between Shtchapina and Tolbatchik acc. to KOM. loc. cit., Tolbatchik BEZAIS 1908.

Type of distribution: Circumpolar.

Geographical area: From northernmost Scandinavia, Kola penins. and Perm prov., southwards to Spain, Italy and Caucasus. Asia: at Yenisei from about 62° N. lat., from Vilju and Kolyma districts, southwards to Pamir, Turkestan, Corea and Japan. America: (var. *americana*) from Alaska to Newfoundland southwards to California, Texas and Florida.

Plantaginaceae LINDL.

Plantago arctica DECAISNE in DC., Prodr. XIII (1852) p. 700.

It is not clear to which plant this species refers. The description states that it grows in Kamtchatka and that specimens were seen in Herb. Paris. No collector is given. Acc. to information kindly given by Prof. PILGER in a letter, he was unable to find the type specimen in the herbarium of Paris, where he sought for it in 1926. To judge from the description, *P. arctica* might well have been

based on small specimens of *P. camtschatica*. In any case, no other *Plantago* form applicable to it is known to me from our area.

696. ***Plantago camtschatica*** Cham.[1] ex Link, Enumer. Plant. Hort. Reg. Bot. Berol. alt. I (1821) No. 1098 p. 120.

Cham. & Schlecht. in Linnaea I (1826) p. 165, cfr. Cham. & Schlecht. in Linnaea VI (1831) p. 589; Ledeb., Fl. Ross. III p. 478 *(kamtschatica)*; Barnéoud, Monogr. Gen. Fam. Plantagin. p. 13 (*Kamtschatica*), Dcne in DC, Prodr. XIII p. 699 *(Kamtschatica)*; Herder, Pl. Radd. Monopet. No. 610 (351) in Acta Horti Petrop. X: 1 (1887) p. 62. — *Plantago major* f. *scopulorum* Kjellman, Komm. faner. fl. p. 294. — *Plantago major* Fedtsch., Fl. Îl. Comm. p. 98 pro parte.

South Kamtchatka: Cape Lopatka W. coast June 19th 1920 Hn No. 69, do. E. coast June 22nd 1920 Hn No. 99; Toporkoff Island Aug. 8th 1920 Hn No. 784.

East Kamtchatka: The entrance of Avatcha Bay Perfiljef 1911; Petropavlovsk »ad Portum St. Petri et Pauli legit veri 1816 Ad. v. Ch.» (Hb. Berol.), do. Ramenski 1908, do. Perfiljef 1910, do. July 21st 1920 Hn No. 532, do. June 1st 1921 Hn No. 1617, do. June 3rd, June 8th and July 20th 1928 W. Eyerdam.

Commander Islands: Bering Island Kjellman (sub *P. major* Hb. Holm.), Grebnitzky 1879.

»Kamtchatka»: Eschscholtz, Choris, Rastargujeff, Stewart, Kastalsky, Rieder.

In South Kamtchatka this plant was seen only at the places enumerated above. The statement on the herbarium species of Rieder repeated by Herder loc. cit. »auf allen steinigen Bergen» is thus not correct. The plant is probably exclusively a seashore plant in Kamtchatka.

P. camtschatica approaches to the Chinese — Central Asiatic *P. depressa* Willd. It differs from that species in having larger capsules, shorter spikes, denser pubescence, and only four seeds in the capsules (at any rate in most of them).

Type of distribution: Asiatic Pacific.

Geographical area: Commander Islands, S.E. Kamtchatka, the Kuriles, Saghalin, Amur prov., Ussuri, Corea and the Japanese Islands.

A report from the Verchojansk distr. given by Komarov in Introd. Fl. Jacout. needs checking.

697. ***Plantago macrocarpa*** Cham. & Schlecht. in Linnaea I (1826) p. 166.

Barnéoud, Monogr. Gen. Fam. Plantagin. p. 34; Herder, Pl. Radd. Monopet. No. 614 (355) in Acta Horti Petrop. X: 1 (1887) p. 65; Fedtsch., Fl. Îl. Comm. p. 99.

[1] It seems clear that Chamisso and not Link should be cited as the author of the species. Compare Cham. & Schlecht. in Linnaea I (1826) p. 165, where Chamisso writes »*P. camtschatia* Nob.».

Commander Islands: Bering Island KJELLMAN, DYBOVSKY 1879 and acc. to FEDTSCH. loc. cit. GREBNITSKY 1900; Copper Island MOROZEVICZ 1903 acc. to FEDTSCH. loc. cit.

West and North Kamtchatka: Karaginsk Island MERTENS.

P. macrocarpa is a very peculiar species, whose capsules acc. to CHAM. & SCHLECHT loc. cit. do not open when ripe, but fall off unopened. (Comp. PILGER in FEDDE, Rep. Spec. Nov. XXIII p. 241). The statement regarding the existence of the species on Karaginsk Island may require confirmation as MERTENS' plants are not always correctly labelled. As far as my experience goes, however, those labelled »Karaginsk» are practically always reliable, while those labelled »Petropavlovsk» are unreliable and in some cases were even apparently collected in Unalashka.

Type of distribution: Northern Pacific.

Geographical area: Asia: Karaginsk Island?, Commander Islands. America: the Aleutian Islands, the southern coast of Alaska southwards to Washington (acc. to ST. JOHN 1924).

698. ***Plantago major*** L., Sp. pl. ed. I (1753) p. 112.

?PENNANT, Arct. Zool. (1784) p. CXIV; ?GEORGI, Beschreib. III: 4 p. 736; ?ERMAN, Verzeichn. p. 57; ?CHAM. & SCHLECHT. in Linnaea VI (1831) p. 589; ?LEDEB., Fl. Ross. III p. 477; FEDTSCH., Fl. Îl. Comm. p. 89 pro parte.

South Kamtchatka: Between Bolsheredsk and Apatcha on the path noted by HN; Apatcha village noted by HN; between Natchika and Korjaka on the path at the »jurta» noted by HN; Savoiko village July 3rd 1928 W. EYERDAM; Korjaka village noted by HN.

East Kamtchatka: Petropavlovsk July 16th 1922 P. T. NOVOGRABLENOF; between Petropavlovsk and Savoiko July 9th 1920 HN No. 374; between Petropavlovsk and Avatcha volcano on the path near Petropavlovsk noted by HN.

Commander Islands: Bering Island DYBOVSKY acc. to FEDTSCH. loc. cit.; Copper Island DOBROTVORSKY acc. to FEDTSCH. loc. cit.

Central Kamtchatka: Mashura Aug. 9th 1921 HN No. 3499 a (MALAISE); Kresti BEZAIS 1908.

var. ***micrantha*** PILGER in Notizbl. Bot. Gart. u. Mus. Berlin-Dahlem (1922) p. 114.

Plantago asiatica PENNANT, Arct. Zool. (1784) p. CXIV. — *Plantago major* β *asiatica* HERDER, Pl. Radd. Monopet. No. 609 in Acta Horti Petrop. X: 1 (1887) p. 59 quoad pl. Kamtch.; ?FEDTSCH., Fl. Îl. Comm. p. 99. — *Plantago major* KOM. in herb. quoad pl. Kamtsch. pro parte.

South Kamtchatka: The hot springs at upper Unkanakchek Aug. 19th 1922 HN No. 4314; the hot springs at upper Karymchina R. 400 m. Sept. 10th 1921 HN No. 3084; the hot springs at »Gorachie Gora» upper Para-

tunka R. KOMAROV 1908; the hot spring »Malenki klutchik» Bannaja, 375 m. Sept. 12th 1921 HN No. 3162; Paratunka KOMAROV 1908, do. at the hot springs Febr. 13th 1921 HN No. 1510, do. June 17th 1921 HN No. 1743; the hot springs at Natchika VOSSNESENSKY 1847, do. KOMAROV 1908, do. RUBINSKI 1909, do. Sept. 2nd 1921 HN No. 3002 a.

East Kamtchatka: The crater of Uzon volcano KOMAROV 1909 (Hb. Berol.).

Commander Islands: ?Bering Island DYBOVSKY, GREBNITZKY and STEJNEGER, all acc. to FEDTSCH. loc. cit.; ?Copper Island MOROZEVICZ acc. to FEDTSCH. loc. cit.

Central Kamtchatka: Malka STUBENDORFF and RIEDER acc. to HERDER loc. cit., do. PROTOPOPOF 1908; Pushtchina KOMAROV 1909; the hot springs at Anauna R. Aug. 22nd 1926 MALAISE No. 373.

»Kamtchatka»: PETERS acc. to HERD. loc. cit., RIEDER (Hb. Berol.).

In South Kamtchatka the head-species was found in villages and on paths. It is certainly introduced there. Var. *micrantha* on the other hand was exclusively found at the hot springs. In habitus var. *micrantha* rather closely resembles *P. asiatica*, from which species it differs in its sessile smaller flower with short corolla-lobes. My material was kindly controlled by Prof. PILGER.

Type of distribution: The head species: Cosmopolite. var. *micrantha* ?Endemic.

Geographical area: the head species: Introduced and naturalized practically all over the world. The subsp. *micrantha*: so far only known from our area.

Plantago media L., Sp. pl. ed. I (1753) p. 113.

West and North Kamtchatka: Tigil near the apothecary, LEVITZKY.

Whether this species is indigenous or not in northern Kamtchatka it is difficult to decide. It seems most probable that it occurred there only occasionally.

Type of distribution: Eurasiatic.

Geographical area: Throughout Europe, N. Africa, Asia eastwards to Jakutsk distr., W. Amur. prov., Chili and Shantung (acc. to FORBES & HEMSL.). Introduced into Eastern N. Amer.

Rubiaceae JUSS.

Galium aparine L., Sp. pl. ed. I (1753) p. 108 *(Aparina)*.

HERDER, Pl. Radd. Monopet. No. 16 in Bull. Mosc. 37:1 (1864) p. 212 et Radde, Reisen III:1 p. 23 (α *genuinum*, β *Vaillantii*).

»Kamtchatka»: KUSMISCHEFF.

If KUSMISCHEFF's specimen really originates from our area the species must certainly have been introduced and have occurred there only occasionally.

699. ***Galium boreale*** L., Sp. pl. ed. I (1753) p. 108.

CHAM. in Linnaea VI (1831) p. 591; ERMAN, Verzeichn. p. 61; LEDEB., Fl. Ross. II p. 412; HERDER, Pl. Radd. Monopet. No. 22 in Bull. Mosc. 37:1 (1864) p. 218 et Radde, Reisen III:1 p. 29 (»var. α LEDEB. = β *latifolium* TURCZ.», var. ε *Kamtschaticum*); HERDER, Add. et Emend. Pl. Radd. Monopet. II p. 21 et in Bull. Mosc. 56:1 (1881) p. 161 (α *vulgare*); MAXIM. in Mél. Biol. IX (1873) p. 264 (var. *kamtschatica*); YABE & YENDO, Fl. Shimushu p. (195) (var. *typica*); KOM., Voy. Kamtch. pp. 181, 454; KUDO, Fl. Paramush. p. 160 (var. *kamtschaticum*). — *Galium rubioides* CHAM. & SCHLECHT. in Linnaea III (1828) p. 220; HOOK. & ARNOTT in BEECHYS Voy. p. 115.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Lower Ozernaja R. noted in A. 96, A. 100; between Javina and Kochegochek noted in A. 91, A. 92; S. of Kochegochek noted by HN; near Sahach noted in A. 191, A. 193; upper Kusingen R. noted in A. 190; S. of Golygina village in meadow noted by HN; lower Golygina R. noted by HN; Golygina R. 25 verst above the village RUBINSKI 1909; Golygina village in heath noted by HN; upper Ksudach R. 200 m. Aug. 4th 1921 HN No. 2642 (A. 83, A. 84); middle Ksudach R. noted in A. 86; between the mouths of Golygina and Opala rivers in meadow noted by HN; the source of S.W. Shadutka R. in meadow noted by HN; the divide between Savan and Shadutka R. noted in A. 80; upper Savan R. 250 m. Aug. 1st 1921 HN No. 2558 (A. 79); Opala R. near Assatcha noted in A. 184, A. 185; lake Kambolnoje Sept. 15th 1922 HN No. 4615 (A. 221); N.W. of Opala volcano noted in A. 66, A. 67, A. 68, A. 69; the hot springs at upper Opala R. Aug. 4th 1922 HN No. 4159 (A. 182); upper Udoshk R. noted in A. 78 b; lower Tolmachovaja R. noted in A. 156, A. 157; the mouth of Balaganchik R. noted in A. 152, A. 153, A. 154; lower Bolshaja R. noted in A. 106, A. 107; middle Karymchina R. noted in meadow by HN; lower Karymchina R. noted in A. 124, A. 151; Agashka R. noted in A. 63; Danilina R. noted in A. 61; Ipelka R. noted in A. 60; the Kohelok pass 660 m. noted by HN; Plotnikovaja R. noted in A. 56; between Bolsheredsk and Apatcha noted in A. 113; lower Bannaja R. in *Angelica ursina*-meadow noted by HN; the hot springs at Siku R. noted in A. 122; Bogatyrjovka July 16th 1920 HN No. 428 a; mt. Tshapochka, Natchika KOMAROV 1908; mt. Zerkalo, Natchika KOMAROV 1908, do. noted in A. 114, A. 119 and up to 670 m.; mt. Palovinaja, Savoiko 600 m. July 8th 1920 HN No. 261; Savoiko July 14th 1928 MALAISE, do. July 12th and 27th 1928 W. EYERDAM; the sources of Poperochnaja R. SAVITCH 1909; Korjaka KOMAROV 1908.

East Kamtchatka: Petropavlovsk RIEDER 1831, do. WRIGHT 1853—56, do. PERFILJEF 1910 (Hb. Berol.), do. July 19th 1920 HN No. 495, do. July 21st 1920 HN No. 533, do. July 10th and 23rd 1928 W. EYERDAM, do. noted in A. 7; Kalashtyrka PERFILJEF 1910; between Petropavlovsk and Avatcha volcano 250 m. Aug. 21st 1920 HN No. 998 (A. 9, A. 16, A. 23, A 43); Avatcha volcano PERFILJEF 1911, do. 695 m. July 31st 1920 HN No. 636; the

Kronoki Pass Komarov 1909; Nishne Kamtchatsk Gudzenko 1910; »steinige Schluchten am Fuss des Schiwelutsch» Erman (Hb. Berol.).

Central Kamtchatka: Milkova Bezais 1909; Mashura Grinop 1909; Shtchapina Aug. 1st 1921 Hn No. 3500 (Malaise); Kunchekla Komarov 1909; Tolbatchik river Protopopof 1909; Klutchi Bezais 1908 (Hb. Berol.), do. Afanasejev 1909; Lake Kurarotchnoje Bezais 1908.

West and North Kamtchatka: Chairusovaja Novikof 1909; between Sedanka and Jelovka Bezais 1909, do. Aug. 20th 1927 Vavilin; Tigil Levitzky 1849, do. Bezais 1909, do. Gudzenko 1910; Pallan Savtchenko 1911.

»Kamtchatka»: »Merk, Langsdorff, Lubarsky, *Lithospermifolium* m. var. *elatior* Hb. Fisch.», Eschscholtz, Stewart, Kusmischeff, acc. to Herder loc. cit. Kastalsky and Mertens, Peters 1831 (Hb. Berol.), Rieder (Hb. Berol.).

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 66, A. 67, A. 68, A. 78 b, A. 83, A. 96, A. 100, A. 114, A. 119, A. 153, A. 184, A. 190, A. 191); Sparse (A. 69, A. 79, A. 86, A. 91, A. 92, A. 107, A. 182); Scattered: (A. 84, A. 185).
In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 56, A. 61, A. 113, A. 122, A. 124); Sparse (A. 151).
In *Betula platyphylla—Thalictrum—Carex* ass.:
Single (A. 152, A. 154, A. 157).
In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 7, A. 9, A. 23, A. 43, A. 106).
In *Betula Ermani—Filipendula—Dryopteris* ass.:
Single (A. 63).
In *Filipendula—Calamagrostis—Sanguisorba* ass.:
Single (A. 193).
In *Carex—Sanguisorba*—Moss ass.:
Single (A. 221); Abundant (A. 60).
In *Vaccinium—Empetrum*—Moss ass.:
Single (A. 16, A. 156).
In *Artemisia arctica—Solidago—Salix* »*arctica*» ass.:
Single (A. 80).

In South Kamtchatka *G. boreale* is a very common plant occurring constantly in all kinds of lowlandmeadows and also often in the *Betula* forests. It was not found in the subalpine meadows (the *Epilobium angustifolium—Geranium—Majanthemum* ass.) of the western coast, and only occasionally in the lower alpine meadows. It flowers from the middle of July to the end of August. The plant is fairly variable but on the whole the Kamtchatka specimens differ considerably from the Scandinavian and should be regarded as a separate variety, var. *kamtschaticum* Maxim. (Prim. Fl. Amur. p. 141), al-

though some of the specimens (for instance Hn No. 636) come rather close to the typical form. Var. *kamtschaticum* differs in having broader and larger leaves (0,7—1,6×2,6—4,5 cm.), more or less setulose, especially on the veins. The stem is rough with bristles, which are particularly frequent on the nodes. The bracts are broad and more or less obtuse. The panicles are on an average more erect and fewer-flowered than in the European plant, and the fruit has longer, soft, not distinctly hamate hairs. Forms approaching var. *kamtschaticum* occur also in other parts of the circumpolar area of the species, especially towards the north (cfr. Wahlenb., Fl. Lapp. p. 46) and the exact limitation of the different forms can hardly be given without monographical treatment.

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland, northernmost Scandinavia, Kola Penins. and the northern Urals, southwards to northern Italy, Thrace and Caucasus. Asia: at Obi from about 67° N. lat., at Yenisei from about 70° N. lat., from lower Lena and Chukch Penins. southwards to Armenia, the western Himalayas, Mongolia, northern China, Corea and central Yezo. America: from Alaska to Quebec southwards to Colorado, Michigan and Pennsylvania (rare to the east).

700. ***Galium kamtschaticum*** Steller ex Roem. & Schult., Syst. Veg. III, Mantissa (1827) p. 186.

Yabe & Yendo, Fl. Shimushu p. (195); Kudo, Fl. Paramush. p. 160 (also var. *oreganum*). — *Galium obovatum* β Ledeb., Fl. Ross. II p. 412 (non *G. obovatum* H.B.K.). — *Galium obovatum* Herder, Pl. Radd. Monopet. No. 21 in Bull. Mosc. 37: 1 (1864) p. 217 et Radde, Reisen III: 1 p. 28; Maxim. in Mél. Biol. IX (1873) p. 263.

Northern Kuriles: Paramushir Kudo 1920 acc. to Kudo loc. cit.; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Kurile lake noted by Hn; upper Kidipalok R. Sept. 3rd 1922 Hn No. 4467; middle Kidipalok R. Sept. 5th 1922 Hn No. 4495; upper Unkanakchek R. noted in A. 197, A. 199; upper Kusingen R. Aug. 15th 1922 Hn No. 4246; the junction of Golygina and Ksudach rivers noted by Hn; middle Opala R. in *Betula*-forest noted by Hn; Akhomten Bay Sept. 10th 1920 Hn No. 1272; upper Abshen R. in *Betula*-forest noted by Hn; Agashka R. noted in A. 62, A. 63, A. 65; Bolsheredsk July 13th 1921 Hn No. 2129; Uzdêtz R. Komarov 1908; Mt. Zerkalo, Natchika 600 m. Sept. 3rd 1921 Hn No. 3019; Poperochnaja R. Komarov 1908 (Hb. Berol.); »Suchaja Topolovaja» R. Komarov 1908; mt. Palovinaja July 14th 1928, Aug. 1st 1928 and Sept. 1st 1928 W. Eyerdam.

East Kamtchatka: The mouth of Ilkinoj R. Komarov 1909.

»Kamtchatka»: »*Galium Kamtschaticum* fructu hispido vid. Icon. et descr. Steller (Herb.) Pall.» (Type specimen in Hb. Berol.); Peters acc.

to HERDER loc. cit.; collector unknown »*Galium obovatum* HB. B. KN. *G. paridifolium* ESCHSCH.».

Noted in the following associations:

In *Betula Ermani—Filipendula—Dryopteris* ass.:
Sparse (A. 62, A. 63, A. 197).
In *Alnus hirsuta—Filipendula—Dryopteris* ass.:
Single (A. 65, A. 199).

In South Kamtchatka *G. kamtschaticum* is not common. It occurs here and there in the *Betula Ermani* forests, in the *Alnus hirsuta* marshes and sometimes also along the margins of the *Alnus fruticosa* thickets up to about 600 m. above the sea. It flowers in July and the beginning of August.

The hairiness of our plant is somewhat variable. Most specimens have the middle and upper leaves pilose above, but practically glabrous beneath (α *hirsutum* TAKEDA in Bot. Mag. Tokyo XXIV, 1910 p. 65), while others have them more or less pilose also beneath. The size of the plant as well as the form of the leaves vary slightly, but on the whole all Kamtchatka specimens together form a fairly distinct type.

The geographical area is difficult to state with certainty. Specimens which I have seen from Unalashka agree well with the Kamtchatka plant. *G. kamtschaticum* is further reported by PIPER from one locality in Washington, and a form regarded by PIPER as a variety, var. *oreganum* (= *G. oreganum* BRITT.), with acute and acutish leaves, is reported from Washington and Oregon. In Eastern America our plant covers a comparatively large area. I have not seen any specimen of the Washington plant.

Type of distribution: Bicentric; Northern Pacific and Eastern American.

Geographical area: Asia: S.E. Kamtchatka, the Kuriles, Saghalin, Yezo, Honshu, Sihoku and Kiushiu. America: Unalashka, Washington 48° N. lat. acc. to PIPER. Also in E. America from Newfoundland 49° N. lat. southwards to New York 44° N. lat. (acc. to FERNALD).

Galium Mollugo L.

East Kamtchatka: Petropavlovsk, at the farm Aug. 8th 1921 HN No. 3648 P. T. NOVOGRABLENOF.

This plant apparently occurred occasionally introduced at the experimental farm at Petropavlovsk.

701. ***Galium ruthenicum*** WILLD. in L., Sp. pl. I ed. IV (1797) p. 597.

Galium verum var. *lasiocarpum* HERDER, Pl. Radd. Monopet. No. 24 in Bull. Mosc. 37: 1 (1864) p. 222 et RADDE, Reisen III: 1 p. 32; HERDER, Add. et Emend. Pl. Radd. Monopet. II p. 29 et in Bull. Mosc. 56: 1 (1881) p. 169. — *Galium verum* KOM., Voy. Kamtch. pp. 207, 454.

Central Kamtchatka: »Auf Ebenen bei Puschtschina, Scharom, Werchne-Kamtschatsk und Milkowa» RIEDER 1831; Puschtchina Aug. 26th 1924 P. T. NOVOGRABLENOF; Shtchapina KOMAROV 1909; the foot of Kunchekla KOMAROV 1909; Tolbatchik BEZAIS 1908.

West and North Kamtchatka: Tigil BEZAIS 1909 (Hb. Holm.).

»Kamtchatka»: MERK, LUBARSKY and LEVITZKY all acc. to HERDER loc. cit.

This plant was never seen in South Kamtchatka. Whether it should be retained as a separate species or united with *G. verum* as a variety seems unclear. It has, however, a geographical area of its own.

Type of distribution: Eurasiatic.

Geographical area: As *G. ruthenicum* is usually regarded as a variety of *G. verum* it is difficult to give the exact area. In Europe it occurs from central and southern Russia eastwards (adventive in some few localities in Scandinavia and Finland). Asia: throughout Siberia, more common towards the east.

702. ***Galium trifidum*** L., Sp. pl. ed. I (1753) p. 105.

HERDER, Pl. Radd. Monopet. No. 20 in Bull. Mosc. 37: 1 (1864) p. 216 et RADDE, Reisen III: 1 p. 27 (»α forma europaea et asiatica»); HERDER, Add. et Emend. Pl. Radd. Monopet. II p. 19 et in Bull. Mosc. 56: 1 (1881) p. 159 (»α *typicum* Rgl.»); YABE & YENDO, Fl. Shimushu p. (195); FEDTSCH., Fl. Îl. Comm. p. 68; KUDO, Fl. Paramush. p. 159. — ». . . ein *Galium*, welches unserm *uliginoso* nicht unähnlich ist, aber weder Blüthe noch Früchte zeigte» MERTENS, Bemerk. Fl. Koragins p. 65. — *Galium palustre* FEDTSCH., Fl. Îl. Comm. p. 67.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Kurile Lake Aug. 27th 1922 HN No. 4405; the hot springs at upper Unkanakchek Aug. 19th 1922 HN No. 4312; Kusetenek R. noted by HN; upper Ksudach R. noted by HN; middle Assatcha R. Aug. 11th 1922 HN No. 4222; Lake Kambolnoje noted in A. 219; Akhomten Bay Sept. 12th 1920 HN No. 1344 and 1349; upper Udoshk R. July 26th 1921 HN No. 2434; the mouth of Bolshaja R. KOMAROV 1908; the hot springs at Karymchina R. 400 m. Sept. 10th 1921 HN No. 3110; 10 km. W. of Bolsheredsk Aug. 26th 1921 HN No. 2975 a; Bolsheredsk July 10th 1921 HN No. 2108; Apatcha KOMAROV 1908; the hot spring »Malenki klutchik», Bannaja 375 m. Sept. 12th 1921 HN No. 3160; the hot spring »Gorochie gora», upper Paratunka R. KOMAROV 1908; Bogatyrjovka July 16th 1920 HN No. 428 b; Lake Natchika KOMAROV 1908; Nikolajevsk Aug. 11th 1920 HN No. 845 b; Hutor June 30th 1928 MALAISE, do. July 8th 1928 W. EYERDAM; the delta of Avatcha R. RAMENSKI 1908; Avatcha village RAMENSKI 1908; the hot springs at Natchika KOMAROV 1908, do. Sept. 2nd 1921 HN No. 2989; Savoiko KOMAROV 1908, do. July 10th, July 16th and Aug. 28th 1928 W. EYERDAM, do. July 15th 1928 MALAISE; Lake Ovalni KOMAROV 1908.

East Kamtchatka: Petropavlovsk July 7th 1928 W. EYERDAM; Uzon KOMAROV 1909 (sub *G. palustre*).

Commander Islands: Bering Island KJELLMAN (sub *G. palustre*); Copper Island DYBOVSKY.

Central Kamtchatka: Kirganik KOMAROV 1909; the Kronoki path KOMAROV 1909; Mashura KOMAROV 1909; Klutchi July 18th 1926 MALAISE No. 374; Kurarotchnoje R. BEZAIS 1908 (sub *G. palustre*).

West and North Kamtchatka: ?Karaginsk Island acc. to MERTENS loc. cit.

»Kamtchatka»: STEWART and KUSMISCHEFF acc. to HERDER loc. cit., KASTALSKY, RIEDER.

Noted in the following association:

In *Carex—Sanguisorba*—Moss ass.:
Single (A. 219).

In South Kamtchatka *G. trifidum* occurs here and there along streams and at the hot springs. It flowers in July.

Some of the above-enumerated specimens, e. g. those from Akhomten bay, agree fairly well with the Scandinavian plant, but most of them are higher-grown (up to 50 cm.) and have broader leaves than is usually the case in Scandinavia. The pedicels are often glabrous or glabrate. They agree fairly well with the type described by WIEGAND (Bull. Torr. Bot. Club. 24, 1897, p. 391) as var. *pacificum* and should probably be referred to that variety.

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland, northernmost Scandinavia, Kola penins. and northern Russia, southwards to central Scandinavia, Courland and central Russia, also in Styria. Asia: at Obi from about 67° N. lat., at Yenisei from about 68° N. lat., from Jakutsk distr. and Kamtchatka, southwards to Akmolinsk prov., northern Mongolia, Corea and southern Japan. America: from Alaska to Labrador and Newfoundland, southwards to California, Colorado, Michigan and New York.

703. ***Galium triflorum*** MICHX., Fl. Bor. Amer. I (1803) p. 80.

South Kamtchatka: The junction of Golygina and Ksudach rivers Aug. 6th 1921 HN No. 2705 (A. 89, A. 90); S. of Ipelka mts. Sept. 17th 1922 HN No. 4524; Bolsheredsk S. of the river July 13th 1921 HN No. 2118 (A. 57); middle Plotnikovaja R. noted in A. 56; mt. Zerkalo, Natchika KOMAROV 1908; »Suchaja Topolovaja» R. KOMAROV 1908; Savoiko, Palovinaja R. KOMAROV 1909, do. July 6th 1920 HN No. 246 b, do. July 16th and 31st 1928 W. EYERDAM, do. July 14th 1928 MALAISE; between Savoiko and Korjaka KOMAROV 1908; Korjaka KOMAROV 1908.

East Kamtchatka: The mouth of Ilkinoj R. KOMAROV 1909.

Central Kamtchatka: Near Korjatskaja volcano Aug. 3rd 1925 P. T. Novograblenof (Hb. Holm.); Mashura Komarov 1909; Shtchapina Komarov 1909, do. July 21st 1921 Hn No. 3466.

Noted in the following associations:

In *Betula Ermani—Filipendula—Equisetum hiemale* ass.:
Single (A. 57, A. 89, A. 90).
In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 56).

In South Kamtchatka *G. triflorum* is rare and was only seen in the localities enumerated above; Kamtchatka specimens of this plant have on an average more obovate-lanceolate leaves than the American, which usually have elliptic-lanceolate leaves. It thus approaches to the plant from Corea described by Komarov as *G. trifloriforme*, which acc. to him differs in having obovate leaves, practically straight stem and dense long bristles on the fruits, while *G. triflorum* has »ovate-lanceolate leaves, decumbent or ascendant stem and comparatively shorter bristles on the fruits» (Kom., Fl. Manshur. III: 2 p. 489). I have seen too little material of *G. trifloriforme* to be able to judge whether it should be united with *G. triflorum* or not.

The plant from Kashmir and Punjab passing as *G. triflorum* should, however, certainly be regarded as a separate species. Its stems are glabrous and are thus lacking in the very characteristic, downward-turned bristles, of *G. triflorum;* its rich-flowering panicles are apical, its bracts, flowers, and fruits much smaller than those of *G. triflorum*, and the pedicels are shorter and thinner.

Type of distribution: American, transgressing into W. Europe and E. Asia.

Geographical area: Europe: Central and northern Scandinavia, southern Finland, scattered localities in Olonetz, Vologda and central Perm, southwards to Tver and Moskva, also isolated localities in the Alps. Asia: Jakutsk distr. (acc. to Kom. 1926), Udskoj distr. and S.E. Kamtchatka. On Saghalin, the Kuriles, Yezo, Honshu, Sikoku and Corea the doubtfully distinct *G. trifloriforme* Kom. The Himalaya plant reported as *G. triflorum* is a distinct species. America: from Alaska to Newfoundland southwards to California, Colorado (acc. to Rydb.) and Florida (acc. to Small). S.W. Greenland. A map of the Eastern American distribution is given by Fernald in Mem. Gray Herb. II (1925) p. 319.

Caprifoliaceae Vent.

704. ***Sambucus racemosa*** L., Sp. pl. ed. I (1753) p. 270.

subsp. ***kamtschatica*** (E. Wolf) nov. comb.

»*Sambucus racemis compositis, ovatis, . . .*» Gmel., Fl. Sib. III p. 147 quoad pl. Kamtsch. — *Sambucus racemosa* Pennant, Arct. Zool. (1784) p. CXV; Pallas, Fl.

Ross. II p. 29 quoad pl. Kamtsch; GEORGI, Beschreib. III: 4 p. 865 quoad pl. Kamtsch.; HOOK. & ARNOTT in Beechy's Voy. p. 115; LEDEB., Fl. Ross. II p. 383 quoad pl. Kamtch.; HERDER, Pl. Radd. Monopet. No. 2. in Bull. Mosc. 37: 1 (1864) p. 193 et RADDE, Reisen III: 1 p. 4 quoad pl. Kamtsch.; KOM., Voy. Kamtch. p. 452. — *Sambucus* DITMAR, Reisen I p. 630. — *Sambucus kamtschatica* E. WOLF in Mitteil. Deutsch. Dendrolog. Ges. (1923) p. 32 et p. 32 fig. 1—3, p. 33 fig. 1.

South Kamtchatka: Upper Abshen R. noted by HN; above Haikovaja noted by HN; middle Karymchina R. noted by HN; S.E. of Bolsheredsk noted by HN; Bolsheredsk noted by HN; S. of Apatcha noted by HN; between Bolsheredsk and Apatcha noted by HN; the mouth of Bannaja R. noted by HN; lower Bannaja R. noted by HN; mt. Zaikin Mys, Paratunka R. KOMAROV 1908; Paratunka village KOMAROV 1908 (Hb. Berol.); Lake Blishne KOMAROV 1908; Nikolajevsk KOMAROV 1908; Natchika RUBINSKI 1908 (sub *S. kamtschatica* E. WOLF); Savoiko July 7th 1920 HN No. 244 b, do. July 18th 1928 W. EYERDAM; »Avatcha Bay» acc. to HOOK. & ARNOTT loc. cit.

East Kamtchatka: Sierroglaska KOMAROV 1908; Petropavlovsk GUDZENKO 1910; 5 verst S. of Korjatskaja RUBINSKI 1908; between Shupanova and Semjatchik acc. to KOM. loc. cit.; mt. Krasheninnikof acc. to KOM. loc. cit.

Central Kamtchatka: Malka STEWART, do. PROTOPOPOF 1908; between Malka and Ganala SHUKOVSKI 1908; Sharomsk KOMAROV 1909; Kosyrevsk PROTOPOPOF 1909; Klutchi BEZAIS 1908 (Hb Berol.), do. AFANASEJEV 1909, do. June 19th 1921 HN No. 3370 (MALAISE).

West and North Kamtchatka: Oblukovina acc. to DITMAR loc. cit.; Tigil LEVITZKY 1848 (not original label).

»Kamtchatka»: STELLER acc. to PALLAS loc. cit.; »Hb. PALLAS» (Hb. Hort. Petrop., certainly the specimen of STELLER).

This plant was found only in the northern part of South Kamtchatka. It occurs in the river-valleys usually in the *Filipendula kamtchatica* thickets but sometimes also in the *Betula* forests. It flowers at the end of June and the beginning of July.

Our plant is well described and figured by E. WOLF loc. cit., who regards it as a separate species. In a large body of material, however, specimens can be found that have practically entire petals sometimes of about the same length as the calyx-tube, and much narrower leaflets than those illustrated by WOLF loc. cit. p. 33 fig. 1. Such specimens strongly resemble specimens of *S. racemosa* from the middle Yenisei R. and certainly cannot be specifically distinguished from them. Our plant might possibly be referred to subsp. *pubescens* SCHWERIN (Mitteil. Deutsch. Dendr. Ges. 1909 p. 47), which, however, to judge from his quotations, seems to be a synonym of *S. dahuria* BATALIN (well described by E. WOLF in Mitteil. Deutsch. Dendrol. Ges. 1923 p. 32 as subsp. *dahurica*), which is not our form.

Type of distribution: Eurasiatic.

Geographical area: In several forms: Europe: from Central Germany and southern Poland, southwards to the Balkans, also in E. Russia from Vjatka and Ufa eastwards. Asia: from the Urals eastwards, at Obi from about 62° N. lat., at Yenisei from about 65° N. lat., from Vilju and Jakutsk districts and from Kamtchatka, southwards to northern Mongolia and Corea. Subsp. *kamtschatica* at least in Kamtchatka and in Saghalin. In Japan, Corea and China several closely related species (*S. latipinna* Nakai northwards to Saghalin and the southern Kuriles). In America: the closely related *S. pubens* Michx.

705. ***Linnaea borealis*** L., Sp. pl. ed. I (1753) p. 631.

Pennant, Arct. Zool. (1784) p. CXVI; Georgi, Beschreib. III: 5 p. 1110; Chamisso in Linnaea III (1828) p. 137; Chamisso, Reise u. d. Welt p. 347; Mertens, Bemerk. Fl. Koragins p. 64; Ledeb., Fl. Ross. II p. 392; Herder, Pl. Radd. Monopet. No. 14 in Bull. Mosc. 37: 1 (1864) p. 209 et Radde, Reisen III: 1 p. 20; Miyabe, Fl. Kuril. p. 238; Yabe & Yendo, Fl. Shimushu p. (194); Fedtsch., Fl. Îl. Comm. p. 67; Kudo, Fl. Paramush. p. 161 (form. *arctica*); Fernald in Rhodora 24 (1922) p. 211. — »*Linnaea floribus geminatis* . . .» Gmel., Fl. Sib. III p. 128.

Northern Kuriles: Paramushir Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka, east coast June 17th 1920 Hn No. 5; N. of Ozernaja village noted by Hn; Javina Rubinski 1909; near Javina noted in A. 95; near the junction of Kisipalok and Kidipalok rivers noted by Hn; near Golygina village Aug. 8th 1921 Hn No. 2771; N.W. of Shadutka volcano noted in A. 81; Topik noted by Hn; Lake Kambolnoje noted in A. 218; Akhomten Bay 720 m. noted in A. 29, do. noted in A. 32, A. 33; Opala volcano 620 m. July 21st 1921 Hn No. 2348 (A. 74, A. 75), do. 700 m. July 21st 1921 Hn No. 2385; mt. Babi Kamen, Paratunka R. Komarov 1908; near mt. Stoll noted in A 121; Shalsan R. Komarov 1908; mt. Zerkalo, Natchika 830 m. noted in A. 117; mt. Palovinaja, Savoiko July 22nd 1928 W. Eyerdam; Savoiko Komarov 1908, do. Savitch 1908; Poperochnaja R. Komarov 1908.

East Kamtchatka: Petropavlovsk acc. to Cham. loc. cit., do. Vossnessensky 1847, do. July 15th 1922 P. T. Novograblenof, do. July 10th 1928 W. Eyerdam; between Petropavlovsk and Savoiko July 5th 1920 Hn No. 215; between Petropavlovsk and Avatcha volcano 350 m. Aug. 22nd 1920 Hn No. 1007; Klutchevskaja volcano June 7th 1927 Malaise; the Chartchina mts. Aug. 12th 1927 Malaise.

Commander Islands: Bering Island Kjellman, Dybovsky 1879, Grebnitzky 1881 and 1894, acc. to Fedtsch. loc. cit. Stejneger and Morozevicz, Protopopof 1909; Copper Island Sandberg.

Central Kamtchatka: Ganala Protopopof 1908; Kirganik Komarov 1909; Mashura Komarov 1909, do. Grinop 1909; Shtchapina Komarov 1909,

do. July 22nd 1921 Hn No. 3469 (Malaise); Tolbatchik Komarov 1909; Anauna R. Aug. 19th 1926 Malaise No. 361; Klutchi Bezais 1908, do. in *Larix dahurica* forest July 27th 1926 Malaise.

West and North Kamtchatka: Utka Rubinski 1908; Tigil Levitzky; Karaginsk Island acc. to Mertens loc. cit.

»Kamtchatka»: Chamisso, Choris, Kusmischeff, Mertens, Peters, Rieder.

Noted in the following associations:

In *Vaccinium—Empetrum*—Moss ass.:
Single (A. 95, A. 218).
In *Pinus pumila—Spiraea*—Moss ass.:
Single (A. 32); Sparse (A. 75); Scattered (A. 29).
In *Pinus pumila—Spiraea—Sphagnum* ass.:
Single (A. 121).
In *Pinus pumila—Rhododendron*—Moss ass.:
Single (A. 81); Sparse (A. 79); Abundant (A. 33).
In *Vaccinium—Empetrum—Rhododendron chrysanthum* ass.:
Scattered (A. 117).

In South Kamtchatka *L. borealis* is fairly common in the *Pinus pumila* thickets and on the heaths. In Central Kamtchatka it also occurs in the *Picea* and *Larix* forests. It flowers in July. Kamtchatka specimens agree fairly well with European. Compare Fernald in Rhodora 24 (1922) pp. 210—212.

Type of distribution: The entire species: Practically circumpolar. The head-form Eurasiatic transgressing into W. America.

Geographical area: The head-form: Europe: from E. Scotland, northernmost Scandinavia, the north coast of Kola Penins. and the arctic Russian mainland, southwards (in the mts.) to N. England, the Alps, the Carpathians and Central Russia (to about 55° N. lat., some few localities S. of that line), also in the Caucasus. Asia: from lower Yenisei and Lena rivers and from Chukch Penins., southwards to Akmolinsk prov., northern Mongolia, Corea and Honshu. America: Eastern Alaska. Subsp. *americana:* from Alaska to Labrador, southwards to N. California, Colorado, S. Dakota, Maryland and W. Virginia. W. Greenland. Subsp. *longiflora:* British Columbia to California. A map of the European distribution is given in Hegi, Ill. Fl. Mitt. Europ. VI p. 247 (the northern limit on that map should be drawn further to the north, so as to enclose the whole of the Kola Penins. and the arctic Urals).

706. ***Lonicera Chamissoi*** Bunge in Kirillov, Lonicer. Russ. Reich (1849) p. 26 (not seen).

Herder, Pl. Radd. Monopet. No. 13 in Bull. Mosc. 37: 1 (1864) p. 208 pl. 2 fig. 1, 2 a et Radde, Reisen III: 1 p. 19; Herder, Add. et Emend. Pl. Radd. Monopet. I p. 25; Maxim. in Mél. Biol. X (1878) p. 60; Rehder in Fourteenth

ann. rep. Missour. Bot. Gard. (1903) p. 117; Kom., Voy. Kamtch. pp. 40, 188, 412, 452 et Fl. Penins. Kamtsch. p. 331. — »*Lonicera pedunculis bifloris, baccis distinctis . . .*» Gmel., Fl. Sib. III p. 129 quoad pl. Kamtsch. — ?*Lonicera xylosteum* var. Pallas, Fl. Ross. I: 1 p. 56. — *Lonicera nigra* Cham. & Schlecht. in Linnaea III (1828) p. 137; Hook. & Arnott in Beechy's Voy. p. 115; Ledeb., Fl. Ross. II p. 389 quoad pl. Kamtsch. et Kuril. — »*Lonicera* mit kleinen rothen Beeren» Ditmar, Reisen II p. 96.

South Kamtchatka: W. of Shadutka volcano in the »volcanic desert» noted by Hn; N.W. of Shadutka volcano noted in A. 81; N.W. slope of Assatcha mts. 410 m. in *Betula*-forest noted by Hn; near the hot springs at upper Opala R. noted in A. 180; upper Abshen R. noted in *Betula*-forest; Tolmachovaja R. July 8th 1922 Hn No. 3875; near the mouth of Ipelka R. noted in A. 57; Agashka R. noted in A. 62, A. 63; S.E. of Bolsheredsk at Plotnikovaja R. noted by Hn; Kanesheva R. Rubinski 1909; Bolsheredsk Rubinski 1908; lower Bannaja R. in *Betula*-forest noted by Hn; S. of Apatcha in *Betula*-forest noted by Hn; between Paratunka and Mikisha Komarov 1908; Lake Dalni Komarov 1908; the mouth of Paratunka R. Aug. 11th 1920 Hn No. 831; Uzdets R. Komarov 1908; Natchika Dybowsky; mt. Zerkalo, Natchika 400 m. noted by Hn; Savoiko Komarov 1908; do. Protopopof 1908, do. July 7th 1920 Hn No. 259, do. June 29th 1928 W. Eyerdam; Poperochnaja R. Komarov 1908; between Savoiko and Korjaka Komarov 1908.

East Kamtchatka: Petropavlovsk acc. to Chamisso loc. cit., do. Wright, do. Vossnesensky 1848 (sub *L. Riederiana*), do. Gudzenko 1910, do. Perfiljef 1910; between Petropavlovsk and Savoiko July 9th 1920 Hn No. 376; between Petropavlovsk and Avatcha volcano Aug. 23rd 1920 Hn No. 1056 (f. *lutea*), do. noted in A. 7, A. 9, A. 23; Nalutcheva Perfiljef 1910; Kronoki acc. to Kom. loc. cit.

Central Kamtchatka: Malka acc. to Kom. loc. cit.; the Ganala »tundra» Komarov 1909 (Hb. Berol.); Malaja Nikkolki R. Komarov 1909; Anauna R. Sept. 4th 1926 Malaise No. 360.

West and North Kamtchatka: Kishtchik Rubinski 1908; between Sedanka and Jelovka Bezais 1909.

»Kamtchatka»: Chamisso (sub *L. nigra* Hb. Acad. Petrop.), Eschscholtz (sub »*L. nigra* var. Cham. et Schlecht.») Stewart and Kastalsky acc. to Herder loc. cit., Kusmischeff, »Petropavlovsk Mertens», Peters (Hb. Berol.), Rieder 1833 (sub »*Riederiana* Fisch.»).

Noted in the following associations:

In *Betula Ermani—Filipendula—Dryopteris* ass.:
Single (A. 63); Sparse (A. 62, A. 180).
In *Betula Ermani—Filipendula—Equisetum hiemale* ass.:
Sparse (A. 57).
In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 7, A. 9); Sparse (A. 23).

In *Pinus pumila—Rhododendron*—Moss ass.:
Single (A. 81).

In South Kamtchatka *L. Chamissoi* is commøn in the *Betula Ermani*-forests. It flowers at the end of June and the beginning of July. The fruit is bright red (becoming yellowish when dried), but a form with definitely yellow fruits was also found (Hn No. 1056 f. *lutea* nov. f.).

Type of distribution: Asiatic Pacific.

Geographical area: From Ajan and northern Kamtchatka southwards to near the mouth of Amur R., Saghalin, and Honshu.

707. ***Lonicera coerulea*** L., Sp. pl. ed. I (1753) p. 174.

subsp. ***edulis*** (Turcz. pro var.).

»*Lonicera pedunculis bifloris, baccis coadnate globosis . . .*» Gmel., Fl. Sib. III p. 131 quoad pl. Kamtsch.; Krascheninn., Kamtsch. p. 101 in nota; — *Lonicera xylosteum* Pall., Fl. Ross. I p. 56 quoad pl. Kamtsch.; Pennant, Arct. Zool. (1784) p. CXV. — *Lonicera coerulea* Pall., Fl. Ross. I p. 58 quoad pl. Kamtsch.; Pennant, Arct. Zool. (1784) p. CXV; Georgi, Beschreib. III: 4 p. 780; Langsdorff, Bemerk. p. 229; Cham. & Schlecht. in Linnaea III (1828) p. 138; Chamisso in Linnaea VI (1831) p. 591; Erman, Verzeichn. p. 61; Hook. & Arnott in Beechy's Voy. p. 115; Kittlitz, Denkw. II pp. 256, 272, 321; Ledeb., Fl. Ross. II p. 390; Ditmar, Reisen I pp. 371, 374, 551 et (»*Lonicera*») pp. 108, 429, 447, 563, 687, 706, 715, 731, Reisen II pp. 81, 96, 102; Yabe & Yendo, Fl. Shimushu p. (194). — ». . . des espèces mangeables de *Lonicera*» Langsdorff, Remarque sur le Kamtsch. p. 101. — *Lonicera coerulea* var. *villosa* Herder, Pl. Radd. Monopet. No. 12 in Bull. Mosc. 37: 1 (1864) p. 207 et Radde, Reisen III: 1 p. 18 quoad pl. Kamtsch.; Herder, Add. et Emend. Pl. Radd. Monopet. I p. 21 quoad pl. Kamtsch.; Fedtsch., Fl. Îl. Comm. p. 67. — *Lonicera edulis* Kom., Voy. Kamtsch. pp. 40, 412, 452 et Fl. Penins. Kamtsch. I p. 333. — *Lonicera coerulea* var. *altaica* Kudo, Fl. Paramush. p. 161. — *Lonicera coerulea edulis* Kom., Fl. Penins. Kamtsch. I p. 331.

Northern Kuriles: Paramushir S. Yokoyama 1893, M. Aizawa 1900 acc. to Kudo loc. cit., Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka, W. coast June 19th 1920 Hn No. 62; Kurile Lake noted by Hn; N.W. of Kurile Lake in alpine meadow noted by Hn; Ozernaja Bezais 1909; N. of Ozernaja noted by Hn; Javina noted in A. 95; upper Unkanakchek R. noted in A. 197; S. of Kochegochek noted by Hn; Kochegochek noted in A 213; N. of Kochegochek in heath noted by Hn; Sahach noted in A. 191; upper Kusingen R. noted by Hn; middle Kusingen R. noted by Hn; the junction of Golygina and Ksudach rivers in heath noted by Hn; S. of Golygina village in heath noted by Hn; Golygina village noted by Hn; upper Ksudach R. noted in A. 84; middle Ksudach R. noted in A. 86; between the mouths of Golygina and Opala rivers in heath noted by Hn; N. of Opala village noted in A. 214; W. of Shadutka in »the volcanic desert» noted by Hn; N.W. of Shadutka in heath noted by Hn; upper Opala R. in meadow noted by Hn; do., near Assatcha noted in A. 183, A. 184, A. 185; Lake Kambolnoje noted in A. 218; the hot springs at upper

Opala R. noted in A. 182; Gorelaja volcano 600 m. noted in A. 162; upper Udoshk R. noted in A. 78 b; W. of Opala volcano noted in A. 67, A. 69; Tolmachovaja R. noted in A. 156, A. 157; upper Abshen R. noted in A. 153; lower Bolshaja R. noted in A. 104, A. 106, A. 108; the mouth of Balaganchik R. noted in A. 152, A. 154; middle Karymchina R. in meadow noted by Hn; lower Karymchina R. noted in A. 123; near the mouth of Ipelka R. in margin of a *Rubus chamaemorus* bog noted by Hn; S. of Apatcha in meadow noted by Hn; Apatcha June 17th 1922 Hn No. 3814; lower Bannaja R. in meadow noted by Hn; the hot springs at Bannaja R. Rubinski 1909; »Alochkin tundra», Paratunka R. Komarov 1908; Tarja Bay Vossnesensky 1848, do. Komarov 1908 (Hb. Berol.); Uzdets R. Komarov 1908; mt. Tshapochka, Natchika Komarov 1908; lower Avatcha R. acc. to Ditmar loc. cit.; Savoiko Komarov 1908; do. July 7th 1920 Hn No 296 b, do. W. Eyerdam 1928, do. June 10th 1928 Malaise; between Savoiko and Korjaka acc. to Ditmar loc. cit.; Avatcha Bay acc. to Hook. & Arnott. loc. cit.

East Kamtchatka: Petropavlovsk Kastalsky, do. June 1st 1920 Hn No. 1651; between Petropavlovsk and Avatcha volcano 350 m. Aug. 23rd 1920 Hn No. 1036 (A. 7, A. 9, A. 11, A. 16, A. 42, A. 43); the Kalashtyrka valley Komarov 1908, do. Perfiljef 1910; Ustj-Kamtchatsk Aug. 1925 Malaise.

Commander Islands: Bering Island Dybovsky 1879, Grebnitzky 1894 and acc. to Fedtsch. loc. cit. Morozevicz 1903.

Central Kamtchatka: Malka acc. to Kom. loc. cit.; upper (Bolshaja-) Bystraja R. acc. to Ditmar loc. cit.; between Ganala and Pushtchina Grinop 1909; Pushtchina acc. to Ditmar loc. cit.; between Pushtchina and Sharomsk acc. to Ditmar loc. cit.; Milkova acc. to Kom. loc. cit.; Kirganik acc. to Kom. loc. cit.; Mashura acc. to Kom. loc. cit.; Shtchapina acc. to Kom. loc. cit.; between Stchapina and Tolbatchik Bezais 1908; Tolbatchik acc. to Ditmar loc. cit. and Kom. loc. cit.; Klutchi Bezais 1908, do. Afanasejev 1909, do. June 23rd 1921 Hn No. 3378 (Malaise).

West and North Kamtchatka: Utka Rubinski 1908; Chairusovaja Novikof 1909; Sedanka acc. to Ditmar loc. cit.; Tigil »Ad Erman Hb. Cham.», do. Levitzky; Ettolachan R. acc. to Ditmar loc. cit.

»Kamtchatka»: Kraschenninnikof acc. to Ledeb. loc. cit., Langsdorff and Stewart acc. to Herder loc. cit.; Chamisso (Hb. Berol.) Eschscholtz Hb. Ledeb. sub *L. coerulea* β *villosa*, Choris, Kastalsky, Kusmischeff, »Petropavlovsk Mertens», »von der Lopatka bis Tigil häufig» Rieder 1833.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 67, A. 69, A. 78 b, A. 84, A. 86, A. 153, A. 182, A. 185, A. 191); Sparse (A. 184).

In *Betula platyphylla—Thalictrum—Carex* ass.:
Single (A. 152, A. 157); Sparse (A. 154).
In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 7, A. 9, A. 42, A. 43, A. 106, A. 183).
In *Betula Ermani—Filipendula— Dryopteris* ass.:
Sparse (A. 197).
In *Vaccinium—Empetrum*—Moss ass.:
Single (A. 16, A. 108, A. 156, A. 214); Sparse (A. 95, A. 104, A. 218).
In *Vaccinium—Empetrum*—Lichen ass.:
Sparse (A. 213).
In *Vaccinium—Empetrum—Rhododendron chrysanthum* ass.:
Single (A. 162).

In South Kamtchatka this plant is common in the meadows (except in the *Angelica ursina* meadows), *Betula* forests and heaths of the lowlands, and it also sometimes occurs in the meadows and on the heaths of the lower alpine region. It flowers from the beginning of June to the beginning of July and the berries ripen at the end of August. The old Kamtchadal name of the plant was acc. to KITTLITZ »Aëlt». Nowadays it is called »Shimolust».

Our plant is closely related to L. *coerulea*, from which it differs in its oblong, sweet, very palatable berries, which make an excellent jam, in taste somewhat resembling that made from *Vaccinium Myrtillus* L., while those of typical *L. coerulea* are globose and of a bitter taste. At the end of August the berries of our plant are frequently gathered and preserved for use in the winter. Besides the difference in the form and the taste of the berries, there are also others in regard to the proportion of the flowers and leaves. The most pronounced is, perhaps, that the lobes of the corolla are shorter in comparison with the tube, that the stamens are on an average affixed to the tube at a shorter distance from the sinuses, that the corolla is more hairy, especially in the upper part, and that the leaves are narrower and more oblong. The differences are, however, not so distinct, and I think it might be better to regard the type as a subspecies of *L. coerulea*. The many forms of this circumpolar species make the further study of a large amount of material necessary before the question as to the arrangements of the subdivisions and their geographical area can be settled. Its American relatives are dealt with by FERNALD in Rhodora 27 (1927) p. 1—11.

Type of distribution: Eurasiatic; subsp. *edulis:* Eastern Asiatic.

Geographical area: The entire species: Europe: Scotland, central Scandinavia, from Kola penins., eastern Finland eastwards to the Urals, in the south to Kazan and Orenburg, also in the Pyrenees, the Alps, Jura, the eastern Carpathians, the Illyrian mts., the Balkans and the Caucasus. Asia: in several types throughout Siberia to Kamtchatka and Commander Islands in the north from lower Yenisei and Lena, southwards to Turkestan, China and southern Japan. Subsp. *edulis* (acc. to KOM.): Ochotsk distr., Kamtchatka,

Saghalin, Manchuria, northern Corea and eastern Dahuria. By REHDER & WILSON (Journ. Arnold. Arboret. IX 1928 p. 120) reported also from S.W. Kansu. In W. America acc. to FERNALD loc. cit. *L. cauriana* FERN., and in E. America several varieties of *L. villosa* (MICHX.) ROEM. & SCHULT.

Lonicera orientalis LAM.

REHDER, Manual of Cult. trees and shrubs (1927) p. 83. (var. *longifolia.*) — *L. kamtchatica* Hort. sec. REHDER loc. cit.

Acc. to REHDER loc. cit. this species was supposed to have been introduced into gardens from Kamtchatka in 1888. It certainly does not occur within our area.

Lonicera Periclymenum L.

KRASCHENINN., Kamtsch. p. 103 (not seen); LEDEB., Fl. Ross. II p. 387.

The plant was reported from Kamtchatka after KRASCHENINNIKOF. It certainly does not occur there.

Adoxaceae FRITSCH.

Adoxa Moschatellina L.

PENNANT, Arct. Zool. (1784) p. CXV; GEORGI, Beschreib. III: 4 p. 945; LEDEB., Fl. Ross. II p. 382. — »*Adoxa* . . .» GMEL., Fl. Sib. III p. 165.

The above reports of this plant from Kamtchatka were all based on GMELINS' report, which undoubtedly refers to Ochotsk, which belongs to the »Kamtchatka province». The same probably applies to a specimen in Hb. Acad. Petrop. collected, acc. to the original label, on July 11th 1846 by VOSSNESENSKY. Later »Kamtschatka» was added to the label. Although *A. Moschatellina* occurs in all countries surrounding our area, it is not known with certainty to occur within it.

Valerianaceae DUM.

708. ***Valeriana capitata*** PALL. ex LINK, Jahrb. I: 3 (1820) p. 66.

LEDEB., Fl. Ross. II p. 435; HERDER, Pl. Radd. Monopet. No. 28 in Bull. Mosc. 37: 1 (1864) p. 227 et RADDE, Reisen III: 1 p. 38; KOM., Voy. Kamtch. pp. 201, 452.

East Kamtchatka: Lake Kronoki KOMAROV 1909; the Kronoki Pass KOMAROV 1909 (Hb. Holm.); Ploskaja volcano, »pervaja na dolu sopotchka» PROTOPOPOF 1909; Ustj-Kamtchatsk July 1925 MALAISE No. 540.

Central Kamtchatka: Gremushej R., Korjatskaja volcano KOMAROV 1908; Bystraja R. above Ganalski »tundra» KOMAROV 1909 (Hb. Berol.); the divide between Bystraja R. and Kamtchatka R. KOMAROV 1909; mts. »Ganalski vystraki» July 18th 1928 P. T. NOVOGRABLENOF (Hb. Holm.); Pusht-

china KOMAROV 1909; Anauna R. Aug. 19th 1926 MALAISE No. 358, do. Sept. 5th 1926 MALAISE No. 359.

West and North Kamtchatka: Between Jelovka and Sedanka BEZAIS 1909; Tigil BEZAIS 1908; Pallan SAVTCHENKO 1911.

»Kamtchatka»: »dt. am. TILES. Petrop. 13» (Hb. LEDEB.), MERTENS, LUBARSKY and LEVITZKY acc. to HERDER loc. cit., RIEDER 1833 (sub *Patrinia sibirica*).

This plant has a northern distribution within our area.

Type of distribution: Eurasiatic, transgressing into W. America.

Geographical area: Europe: From E. Kola Penins., Kolgujef and Nova Zembla, southwards to the arctic Russian mainland, in the Urals to about 60° N. lat. Asia: along the Arctic Coast to Chukch Penins., southwards at Obi to about 66° N. lat., at Yenisei to about 68° N. lat., to Vilju distr., Ajan and Kamtchatka. In the mts. also in Irkutsk prov., Sayan Mts., northern Mongolia and Altai, also reported from the vicinity of Tashkent. America: the arctic coast of Alaska to Mackenzie R. southwards in the mts. to British Columbia and Sitcha.

Patrinia rupestris JUSS.

HERDER, Pl. Radd. Monopet. No. 26 in Bull. Mosc. 37: 1 (1864) p. 224 et Radde, Reisen III: 1 p. 35.

Herder reports MERK and KEGEL as having collected this plant in Kamtchatka. Possibly *Valeriana capitata* was mistaken for this plant. *P. rupestris* should most probably be excluded from the flora of our area.

Dipsacaceae LINDL.

Scabiosa sp.

ERMAN, Verzeichn. p. 57; LEDEB., Fl. Ross. II p. 459.

In ERMAN loc. cit. CHAMISSO reports a *Scabiosa*, as he says, probably a new species collected at »Südspitze von Kamtschatka» (by RIEDER). I have sought in vain for the specimen both in Berlin and in Russian herbaria and I do not know what plant he had in mind. Otherwise no *Scabiosa* species is known from our area or could be expected there.

Cucurbitaceae HALL.

Cucumis sativus L.

KOM., Voy. Kamtch. p. 453.

The cucumber is reported by KOMAROV as having been cultivated at Bolsheredsk.

Campanulaceae Juss.

Campanula camtschatica Pall. ex Roem. & Schult., Syst. Veg. V. (1819) p. 152.

A. DC., Monogr. Campan. p. 343; DC. Prodr. VII p. 484; Ledeb., Fl. Ross. II p. 889 *(kamtschatica)*; Trautv. in Acta Horti Petrop. VI: 1 (1879) p. 92 *(kamtschatica)*.

This plant is represented by the type specimen (Willd. Herb. No. 3813) only. This specimem consists of a flower and some loose leaves, which possibly do not belong to the same plant as the flower. It does not warrant closer examination. The species is throughout doubtful and should in any case be excluded from the flora of our area.

709. ***Campanula dasyantha*** M. a Bieb., Fl. Taur. Caucas. III (1819) p. 147.

Cfr. Cham. in Linnaea 4 (1829) p. 37; Ledeb., Fl. Ross. II p. 877; A. DC., Monogr. Campan. p. 230 t. 10 f. 4; Yabe & Yendo, Fl. Shimushu p. (195); Kudo, Fl. Paramush. p. 162. — »*Campanula caule unifloro, foliis ovatis dentatis, calyce hirsuto*» Gmel., Fl. Sib. III p. 160 sec. Ledeb. in Denkschr. Bot. Ges. Regensb. III (1841) p. 93. — *Campanula pilosa* β *dasyantha* Herder, Pl. Radd. Monopet. No. 4 in Acta Horti Petrop. I: 2 (1872) p. 288 et Radde, Reisen IV: 1 p. 6; Trautv. in Acta Horti Petrop. VI: 1 (1879) p. 60. — *Campanula lasiocarpa* Fedtsch., Fl. Îl. Comm. p. 88 quoad syn. Gmel. et Ledeb.

Northern Kuriles: Paramushir C. Taro 1892, T. Matsubara 1915 both acc. to Kudo loc. cit., Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: N.W. of Kurile Lake 600 m. and 1050 m. noted by Hn; N. of Ozernaja village noted by Hn; Illina volcano 400 m. Aug. 23rd 1922 Hn No. 4396; between Javina and Kochegochek Rubinski 1909, do. noted in A. 94; middle Kidipalok R. Sept. 6th 1922 Hn No. 4520 (forma monstruosa?); sources of Kidipalok R. 800 m. Sept. 3rd 1922 Hn No. 4466; between the branches of Kochegochek R. noted in A. 90 b; mt. »Dogshinag» Golygina R. Rubinski 1909; Golygina village Aug. 8th 1921 Hn No. 2770; Shadutka volcano 1125 m. Aug. 2nd 1921 Hn No. 2605, do. 1260 m. noted by Hn; Cape Piratkof Rieder 1831; Topik 580 m. July 28th 1921 Hn No. 2493; Assatcha mts. 1100 m. Aug. 10th 1922 Hn No. 4184, do. at the source of Opala R. July 31st 1922 Hn No. 4076; Listvenichnaja Bay Rieder 1831; Opala volcano 1040 m. July 21st 1921 Hn No. 2288; mts. at Natchika Rieder 1831.

Commander Islands: Bering Island Steller acc. to Gmel. et Ledeb. loc. cit.

West and North Kamtchatka: Tigil Levitzky 1848 (not original label, certainly erroneous).

»Kamtchatka»: Kusmischeff, Peters, Rieder 1831 (sub »*C. Stevenii*?!»).

Noted in the following association:

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 90 b, A. 94).

In South Kamtchatka *C. dasyantha* occurs here and there in the alpine region somewhat more rarely than *C. lasiocarpa*, but often together with that species.

Our plant differs from *C. pilosa* chiefly in the very characteristic and constant form and denticulation of the radical leaves. (Compare Pl. 5 fig. a, b). In the Gishiginsk distr. (collected at Saliv Kulku by F. A. Derbek) a third closely related form occurs with shorter calyx, 2-leaved stem and short-petiolated radical leaves with few teeth, which form probably represents a separate species or a variety of *C. pilosa*.

Type of distribution: Northern Pacific.

Geographical area: Asia: from Commander Island and South Kamtchatka over the Kuriles and Yezo to Honshu. America: the Aleutian Islands, St. Paul Island (M. a Bieb. reports our plant as having been collected by Redowsky, which is denied by Chamisso loc. cit.). The closely related *C. pilosa* from Altai eastwards to the Ochotsk Sea. Probably a separate species at Gishiginsk. I do not know to which species the plant reported as *C. pilosa* or *C. dasyantha* from the Bering Strait region belongs.

Campanula expansa Rud.

Trautv. in Acta Horti Petrop. VI: 1 (1879) p. 80.

Reported as collected in Kamtchatka by Redowsky, who, however, never visited our area.

The species should be excluded from the flora of our area.

Campanula glomerata L.

A. DC., Monogr. Campan. p. 253; Herder, Pl. Radd. Monopet. No. 6 in Acta Horti Petrop. I: 2 (1872) p. 291 et Radde, Reisen IV: 1 p. 9; Trauty. in Acta Horti Petrop. VI: 1 (1879) p. 68.

Both Herper and Trautvetter write that the occurrence of this plant in Kamtchatka is doubtful. In Hb. Acad. Petrop. is preserved a specimen of *C. glomerata* labelled »Merk. Kamtschatka et Sib. or.», which is probably the source of the reports. *C. glomerata* is otherwise not known from our area, and should certainly be excluded from its flora.

710. ***Campanula lasiocarpa*** Cham. in Linnaea IV (1829) p. 39.

Herder, Pl. Radd. Monopet. No. 11 in Acta Horti Petrop. I: 2 (1872) p. 299 et Radde, Reisen IV: 1 p. 17; Trautv. in Acta Horti Petrop. VI: 1 (1879) p. 82; Yabe & Yendo, Fl. Shimushu p. (195); Fedtsch., Fl. Îl. Comm. p. 80 excl. syn. Gmel. et Ledeb.; Kudo, Fl. Paramush. p. 163. — *Campanula algida* A. DC., Monogr. Campan. p. 338 tab. XI fig. 4—6. — *Campanula pilosa α genuina* Herder, Pl. Radd. Monopet. No. 4 loc. cit. p. 255 et 6 quoad pl. Kamtsch.

Northern Kuriles: Paramushir S. Yokoyama 1893 acc. to Kudo loc. cit., Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: W. of Sholtovskaja volcano 500 m. Aug. 23rd 1922 Hn No. 4370 (A. 205); Utashut Island Rieder acc. to Herder loc. cit.; Shadutka volcano 1125 m. Aug. 2nd 1921 Hn No. 2600; N.W. of Shadutka volcano noted by Hn; Topik 470 m. noted by Hn; Assatcha mts. at the source of Opala R. July 31st 1922 Hn No. 4077; Mutnaja Bay Rieder 1831; Akhomten Bay 250 m. Sept. 9th 1920 Hn No. 1192, do. 500 m. Sept. 13th 1920 Hn No. 1379, do. 1000 m. Sept. 18th 1920 Hn No. 1406, do. noted in A. 36 a, 36 b, A. 37 a; Mutnovskaja volcano up to 1460 m. noted by Hn; Gorelaja volcano 800 m. noted in A. 171, do. 1000 m. noted in A. 164, A. 166, first flower for the season noted on July 22nd 1922 by Hn; Opala volcano 1040 m. July 21st 1921 Hn No. 2327, do. July 23rd 1921 Hn No. 2383; Lake Tolmachovaja noted in A. 159; mt. Trubi, Vilju R. Komarov 1908; mt. Saraj, Shalsan R. Komarov 1908; mt. Tshapochka, Natchika Komarov 1908; mt. Palovinaja Aug. 1st 1928 W. Eyerdam; sources of Poperochnaja R. Komarov 1908.

East Kamtchatka: Between Petropavlovsk and Avatcha volcano noted by Hn; Avatcha volcano Perfiljef 1911, do. 675 m. July 30th 1920 Hn No. 602; Mt. Krasheninnikof Komarov 1909; Lake Kronoki Komarov 1909, do. 900 m. Sept. 12th 1921 Hn No. 3603 b; the Kronoki Pass Komarov 1909; between Shtchapina and Kronoki Aug. 30th 1921 Hn No. 3525 and 3532 (Malaise); Klutchevskaja volcano Afanasejef 1909 (Hb. Acad. Petrop. sub *C. pilosa*), do. Kurtashof 1909, do. Aug. 6th 1927 P. T. Novogroblenof (Hb. Holm.)

Commander Islands: Bering Island Kjellman, Dybovsky 1879, (acc. to Fedtsch. loc. cit. Stejneger, Grebnitzky 1894, Gudzenko 1910; Copper Island Dybovsky 1879, Dobrotvorsky 1881 and acc. to Fedtsch. loc. cit. Stejneger and Morozevicz.

Central Kamtchatka: Gremushej R. Korjatskaja volcano Komarov 1909; Ganala Stewart; Kunchekla Grinop 1909 (pro parte); Anauna R. Aug. 19th 1926 Malaise Nos. 354 and 356, do. Sept. 5th 1926 Malaise No. 355.

West and North Kamtchatka: Between Sedanka and Jelovka Aug. 20th 1927 Vavilin (Hb. Holm.).

»Kamtchatka»: Kegel (sub »*C. pilosa* Pall. α *genuina* teste Herder»), Lubarsky (sub »*algida*» Fisch.), Stewart, Kastalsky, Kusmischeff, Peters, Rieder (sub »*C. Stevenii*??»).

Noted in the following associations:

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 159).

In *Vaccinium—Diapensia*—Lichen ass.:
Single (A. 164, A. 166).

In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 37 a, A. 205).
In *Artemisia arctica—Rhododendron kamtschaticum—Salix »arctica»* ass.:
Single (A. 36 a, A. 36 b, A. 171).

In South Kamtchatka *C. lasiocarpa* is common on the heaths and in the meadows of the alpine, especially the upper alpine, region. It flowers from the end of June to the middle of September.

Type of distribution: Northern Pacific.

Geographical area: Asia: From the Bering Straits southwards over Kamtchatka, the Kuriles and Yezo to Honshu. America: from Kotzebue Sound southwards and eastwards to the mts. of British Columbia.

Campanula punctata LAM. and **C. homallanthina** LEDEB.

CHAM. in Linnaea IV (1829) pp. 37, 41.

Reported as found »E. plantis Redowskianis kamtschaticis». REDOWSKI, however, never visited our area, and the species in question should be excluded from our flora.

711. ***Peracarpa carnosa*** (WALL.) HOOK. fil. & THOMS. in Journ. Linn. Soc. II (1858) p. 26.

[*Campanula carnosa* WALL. in ROXBURGH, Fl. Indica II (1824) p. 102.]

South Kamtchatka: Topik 300 m. July 28th 1921 HN No. 2503.

This peculiar little plant was found in the lower part of the *Alnus* region on the S.W. side of Topik volcano. It was flowering when collected. As far as I can see it does not differ essentially from the Himalayan plant described at first by WALLICH as *Campanula carnosa* and later referred by HOOK. fil. and THOMS. to their new genus *Peracarpa*. From Saghalin our plant was described by FR. SCHMIDT (Fl. Sachal. p. 154 tab. IV figs. 14—19, 1864), who mentions nothing about the Himalayan plant, as *Campanula circaeoides*. Acc. to quotations in Japanese literature it was later transferred to the genus *Peracarpa* by H. FEER.[1]

Type of distribution: Japanese—Chinese.

Geographical area: S. Kamtchatka, the Kuriles, Saghalin, Yezo, Honshu, Sikoku and Kiushiu, Formosa, central China (Hupeh), Sikkim, the Kahsia Hills, Nepal, the N.W. Himalayas. In the Philippines the very closely related *P. luzonica* ROLFE.

712. ***Lobelia sessilifolia*** LAMB., in Transact. Linn. Soc. X (1811) p. 260 tab. 6.

CHAM. in Linnaea VI (1831) p. 591 *(sessiliflora)*, ERMAN, Verzeichn. p. 58; LEDEB., Fl. Ross. II p. 869; HERDER, Pl. Radd. Monopet. No. 1 in Acta Horti Petrop. I: 2 (1872) p. 285 et RADDE, Reisen IV: 1 p. 3: KOM, Voy. Kamtsch.

[1] I have not been able to find the place in the literature where this transference is made.

pp. 40, 453. — *Lobelia kamtschatica* PALL. ex SPRENG., Syst. veg. I p. 712. — *Rapuntium kamtschaticum* PRESL., Prodr. Lobel. p. 24.

South Kamtchatka: The junction of Golygina and Ksudach rivers noted in A. 88; middle Ksudach R. Aug. 6th 1921 HN No. 2711; »between Opala R. and Bolshaja R.» RUBINSKI 1909; middle Kanesheva R. noted by HN; the hot springs at Siku R. noted by HN; Apatcha KOMAROV 1908; lower Bannaja R. noted by HN; small lake between Apatcha and Natchika noted by HN; between Paratunka and Mikisha acc. to KOM. loc. cit. p. 40; the hot springs at Natchika KOMAROV 1908.

East Kamtchatka: Near Petropavlovsk Aug. 15th 1928 W. EYERDAM; between Petropavlovsk and Avatcha volcano 175 m. Aug. 6th 1920 HN No. 769 b, do. Aug. 21st 1920 HN No. 978 (A. 20).

Central Kamtchatka: Kirganik KOMAROV 1909; Mashura KOMAROV 1909 (Hb. Berol.).

West and North Kamtchatka: Nemtik RUBINSKI 1908; Tigil acc. to ERMAN loc. cit.

»Kamtchatka»: Collector unknown, probably STELLER, WILLD. Herb. No. 3981; KASTALSKY, KUSMISCHEFF, RIEDER 1831, »RIED. Kamt. Ad ERMAN, CHAMISSO» (Hb. Berol.).

Noted in the following associations:

In *Carex—Myrica—Sphagnum* ass.:
Sparse (A. 20).
In *Carex—Myrica* ass.:
Single (A. 88).

In South Kamtchatka *L. sessilifolia* is comparatively rare. It flowers in August.

Type of distribution: Eastern Asiatic

Geographical area: From Argun and Shilka R. eastwards to the Ochotsk Sea, from Saghalin and Kamtchatka, southwards to Shantung, Corea and southern Japan, also in Yunnan.

Compositae VAILL.

713. ***Solidago virgaurea*** L., Sp. pl. ed. I (1753) p. 880 *(Virgaurea)*.

var. ***leiocarpa*** (BENTH.) A. GRAY in Mém. Amer. Acad. N. Sér. Vol. VI: 1 (1857) p. 395.

»*Solidago caule erecto . . .*» GMEL., Fl. Sib. II p. 164. — *Solidago virgaurea* PENNANT, Arct. Zool. (1784) p. CXVI; GEORGI, Beschreib. III: 5 p. 1245; ERMAN, Verzeichn. p. 57; LEDEB., Fl. Ross. II p. 493 (α *vulgaris*); HERDER, Pl. Radd. Monopet. No. 64 in Bull. Mosc. 38: 1 (1865) p. 395 et Radde, Reisen III: 2 p. 27 (α vulgaris, ε *arctica*); YABE & YENDO, Fl. Shimushu p. (196); FEDTSCH., Fl. Îl. Comm. p. 69; KUDO, Fl. Paramush. p. 163. — [*Amphirapis leiocarpa* BENTH. in London Journ. Bot. I (1842) p. 488].

Northern Kuriles: Paramushir C. Taro 1892, S. Yokoyama 1893, T. Matsubara 1915 all. acc. to Kudo loc. cit., Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: S. of Kambolnaja R. Rubinski 1909; Kurile Lake noted by Hn; N. of Kurile Lake noted in A. 208; N.W. of Kurile Lake noted in A. 210, A. 211, A. 212; Ozernaja R. 30 verst from the mouth Rubinski 1909; N. of Ozernaja village noted by Hn; N.E. of Javina noted in A. 95; between Javina and Kochegochek noted in A. 91, A. 92; W. of Sholtovskaja volcano noted in A. 205; upper Unkanakchek R. noted in A. 196, A. 197, A. 201; Sahach volcano noted in A. 191; upper Kusingen R. noted in A. 190; between the mouths of Golygina and Opala rivers noted by Hn; Golygina village noted by Hn; Golygina R. 25 verst above the village Rubinski 1909; middle Ksudach R. noted in A. 86; upper Ksudach R. noted in A. 83, A. 84; W. of Shadutka volcano in the »volcanic desert» noted by Hn; the divide between Savan and Shadutka rivers noted in A. 80; Opala R. at the mouth of »Tsauats» R. Rubinski 1909; N.W. slope of Assatcha mts. noted in A. 177, A. 178; middle Assatcha R. Aug. 11th 1922 Hn No. 4220; Assatcha volcano near the source of Opala R. noted in A. 183, A. 184, A. 185; Lake Kambolnoje noted in A. 218; near the hot springs at upper Opala R. noted in A. 180; Akhomten Bay Aug. 30th 1920 Hn No. 1157 (Malaise), do. Sept. 9th 1920 Hn No. 1221 and 1223, do. noted in A. 26, A. 27, A. 31, A. 37 b, A. 38; Gorelaja volcano noted in A. 162, A. 165, A. 167; upper Udoshk R. noted in A. 78 b; Opala volcano noted in A. 71, A. 73, A. 77, A. 78 a; N.W. of Opala volcano noted in A. 67, A. 68, A. 69; lower Tolmachovaja R. noted in A. 156; lower Bolshaja R. noted in A. 106, A. 107; middle Karymchina R. noted by Hn; lower Karymchina R. noted in A. 124; the hot springs at upper Karymchina R. on hot earth noted by Hn; Agashka R. noted in A. 62, A. 63, A. 64; the Kohelok Pass noted in A. 125; Bolsheredsk Rubinski 1908; between Bolsheredsk and Apatcha noted in A. 113; lower Bannaja R. noted by Hn; upper (Paratunka-) Bystraja R. noted in A. 128; »Alochkin tundra» upper Paratunka R. Komarov 1908; Paratunka Stubendorff 1849; Bogatyrjovka July 16th 1920 Hn No. 449 b; mt. Tshapochka, Natchika Komarov 1908; mt. Zerkalo, Natchika noted in A. 117, A. 118, A. 119; Savoiko July 5th 1920 Hn No. 267 b, do. July 12th, 15th and 27th 1928 W. Eyerdam, do. July 18th 1928 Malaise; between Savoiko and Korjaka Komarov 1908 (Hb. Berol.).

East Kamtchatka: Petropavlovsk Wright 1853—56, do. Perfiljef 1910, do. July 21st 1920 Hn No. 538, do. July 10th and 22nd 1928 W. Eyerdam; Kalashtyrka Perfiljef 1910; between Petropavlovsk and Avatcha volcano 350 m. Aug. 6th 1920 Hn No. 763, do. noted in A. 7, A. 9, A. 18, A. 23, A. 43; mt. Krasheninnikof Komarov 1909; Uzon Komarov 1909; Ustj Kamtchatsk July 10th 1925 Malaise No. 542.

Commander Islands: Bering Island Steller acc. to Gmel. loc. cit.,

STEJNEGER acc. to FEDTSCH. loc. cit.; Copper Island DOBROTVORSKY and STEJNEGER acc. to FEDTSCH. loc. cit.

Central Kamtchatka: The Ganala »tundra» PROTOPOPOF 1908; Pushtchina PROTOPOPOF 1908; Shtchapina KOMAROV 1909, do. July 25th 1921 HN No. 3389 (MALAISE); Klutchi BEZAIS 1908.

West and North Kamtchatka: Krutugorovaja valley ZELENIN 1908; between Jelovka and Sedanka Aug. 20th 1927 VAVILIN (Hb. Holm.); Tigil LEVITZKY 1848.

»Kamtchatka»: LANGSDORFF (sub *S. spiraeaefolia m.*), CHORIS, RASTARGUJEFF acc. to HERDER loc. cit., STEWART, KASTALSKY, KUSMISCHEFF, MERTENS, POSTELS, ERMAN, PETERS, RIEDER.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 67, A. 68, A. 69, A. 78 b, A. 83, A. 107, A. 184); Sparse (A. 84, A. 86, A. 91, A. 92, A. 119, A. 185, A. 190); Scattered (A. 191).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 113, A. 124).

In *Betula Ermani—Filipendula—Dryopteris* ass.:
Single (A. 62, A. 63, A. 64, A. 196); Sparse (A. 197); Scattered (A. 180).

In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 7, A. 9, A. 18, A. 43, A. 106); Sparse (A. 23, A. 183).

In *Vaccinium—Empetrum*—Moss ass.:
Single (A. 95, A. 156, A. 218).

In *Alnus—Glyceria—Athyrium* ass.:
Single (A. 27, A. 201).

In *Alnus—Calamagrostis—Veratrum* ass.:
Single (A. 165, A. 178).

In *Vaccinium—Empetrum—Rhododendron chrysanthum* ass.:
Single (A. 117, A. 162, A. 167).

In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Sparse (A. 118, A. 125); Scattered (A. 77, A. 212); Abundant (A. 78 a, A. 210).

In *Artemisia artica—Solidago—Salix »arctica»* ass.:
Single (A. 37 b); Sparse (A. 26, A. 80, A. 128, A. 205, A. 208); Scattered (A. 31, A. 71, A. 73, A. 177); Abundant (A. 38).

In South Kamtchatka *Solidago virgaurea* is very common in meadows, *Betula* forests and even on heaths in the lowlands, occurring also in the subalpine meadows, in the *Alnus* belt and in the alpine meadows, in which it is always present and often abundant.

It flowers from the beginning of July to the beginning of September.

Kamtchatka specimens agree fairly well with Scandinavian except in one characteristic. Their achenes are glabrous or only slightly hairy on their upper part, whereas those of the Scandinavian plant are covered with hairs. Forms with glabrous achenes are found, to judge from the scanty material at my disposal, from about Yenisei eastwards and southwards and thus constitute an eastern race of the species. It was at first described as *Amphirapis leiocarpa* by BENTHAM loc. cit. The line of demarcation between it and the head-form is, however, not sharp, and in China both forms seem to appear together.

Type of distribution: Eurasiatic, var. *leiocarpa* Eastern Asiatic.

Geographical area: The entire species: Europe: from northernmost Scandinavia, Kola Penins., northern Russia (from about 68° N. lat. in the Urals) southwards to the Mediterranean Sea. Asia: at Yenisei from about 70° N. lat., from lower Lena and Kolyma rivers and from Chukch Penins., southwards to Asia Minor, the Himalayas, northern India, China (prov. Kwantung) and Formosa. America: ?W. Alaska. Also in N. Africa. To the east of Yenisei most of the specimens belong to var. *leiocarpa*. In E. America the closely related *S. macrophylla* PURSH (Comp. FERNALD in Rhodora 10, 1908 p. 87).

714. ***Aster consanguineus*** LEDEB., Fl. Ross. II (1844—46) p. 473.

Aster alpinus LEDEB., Fl. Ross. II p. 472 quoad pl. ESCHSCHOLTZII; HERDER, Pl. Radd. Monopet. No. 39 in Bull. Mosc. 38: 1 (1865) p. 375 et RADDE, Reisen III: 2 p. 7 (α forma *genuina*) quoad pl. Kamtsch.; KOM., Voy. Kamtch. p. 451. — *Aster peregrinus* HERDER, Pl. Radd. Monopet. No. 43 in Bull. Mosc. 38: 1 (1865) p. 378 et RADDE, Reisen 3: 2 p. 10 quoad pl. Kamtsch. (excl. syn.). — *Erigeron uniflorus* HERDER, Pl. Radd. Monopet. No. 60 in Bull. Mosc. 38: 1 (1865) p. 389 et RADDE, Reisen 3: 2 p. 21 quoad pl. Kamtsch. — *Erigeron Thunbergei* A. GRAY var. β *glabratum* A. GRAY, KUDO, Fl. Paramush. p. 163.

Northern Kuriles: Paramushir T. SAKURAI 1910, T. MATSUBARA 1915 acc. to KUDO loc. cit.

South Kamtchatka: Assatcha mts. 1100 m. Aug. 10th 1922 HN No. 4183.

East Kamtchatka: The hot springs at upper Nalutcheva R. July 31st 1928 W. EYERDAM; Lake Kronoki Sept. 22nd 1921 HN No. 3609 (MALAISE); Kronoki Pass KOMAROV 1909 (Hb. Berol.); Klutchevskaja volcano (»Kamtsch. Sopke») RIEDER 1831, do. BEZAIS 1908 (Hb. Berol.), do. N.E. slope AFANASEJEV 1909, do. KOZLOVSKY 1909, do. KURTASHOF 1909; Ploskaja volcano, »pervaja na dolu sopotchka» PROTOPOPOF 1909.

Central Kamtchatka: Gremushej R. KOMAROV 1908; Korjatskaja volcano Aug. 13th and 14th 1928 W. EYERDAM; Ganala STEWART, do. DYBOVSKY 1879 (sub *Erigeron uniflorus*), do. KOMAROV 1909; mt. »Ganalski vystraki» July 18th 1924 P. T. NOVOGRABLENOF (Hb. Holm.); Pushtchina KOMAROV 1909 (Hb. Holm.); Anauna R. Aug. 19th 1926 MALAISE No. 347 and 350, do. Aug. 1926 MALAISE No. 349; do. Sept. 5th 1926 MALAISE No. 346 and 353.

West and North Kamtchatka: The mouth of Itcha R. BJELOUSSOF 1914 (f. flor. albis) (sub *Erigeron uniflorus*); between Sedanka and Jelovka BEZAIS 1909; Karaginsk Island MERTENS (sub »*A. consanguineus*» written by LEDEB. later added »*Aster peregrinus* PURSH (villosis)! teste RASCH», et sub *Erigeron uniflorus*), do. POSTELS.

»Kamtchatka»: ESCHSCHOLTZ (with a note »von LEDEBOUR als *Aster alpinus* angeführt»), LUBARSKY sub *Erigeron uniflorus* teste HERDER et »*glaciale*» Herb. FISCH., STEWART, KASTALSKY, KUSMISCHEFF.

In South Kamtchatka this plant was only seen in one locality. It seems to be more common northwards.

Our plant is very variable in size, in the number of stem-leaves and in the degree of hairiness, and it presents a multitude of forms forming a chain whose extreme members are comparatively different. The specimen collected by BJELOUSSOF is a peculiar white-flowered, tender form. All these forms, however, differ from *A. alpinus* in possessing numerous, more acute, sometimes long-acuminate, narrower, involucral bracts, strongly hairy involucrum with longer, less rigid, often yellowish hairs, abruptly acuminated leaves and the rays of the ray-flowers somewhat narrower. Some forms are illustrated in Pl. 6 fig. b, c, d.

It may be said to be the Pacific representative of *A. alpinus*.

The plant was first described by THUNBERG as *Inula dubia* (Fl. Jap. 1784 p. 318). The type specimen of that plant in THUNBERG's herbarium at Upsala, which I have seen, agrees exactly with some of my specimens, e. g. MALAISE No. 350 (illustrated in Pl. 6 fig. b). The combination *Aster dubius* cannot, however, be made here, as there already exists a plant bearing that name (KRAUSE in STURM, Fl. Deutschl. ed. 2, XIII. 62, 1905). The next oldest name for the plant is *Aster japonicus* LESS., which cannot be used, as it gives a new specific epithet to an already known plant, *Inula dubia* THUNB., and only describes it by citing that name as a synonym. It can never, then, have been valid (Cfr. Règles Intern. Nomencl. Bot. Art. 51: 1). As far as I can see, therefore, the plant should be named as above. Later it was given the name *Erigeron Thunbergii* by ASA GRAY. If it is referred to the genus *Erigeron* its name should be *E. dubius* (THUNB.) MAKINO (non SPRENG.) in Bot. Mag. Tokyo 18 (1904) p. 18.

Type of distribution: Asiatic Pacific.

Geographical area: Chukch Penins., Gishiginsk distr., Kamtchatka, Ochotsk distr., Saghalin, Yezo, Honshu and Corea.

715. ***Aster sibiricus*** L., Sp. pl. ed. I (1753) p. 872.

GEORGI, Beschreib. III: 5 p. 1244; HERDER, Pl. Radd. Monopet. No. 45 in Bull. Mosc. 38: 1 (1865) p. 379 et RADDE, Reisen III: 2 p. 110. — »*Aster foliis ovatis, oblongis, supra serratis . . .*» GMEL., Fl. Sib. II p. 186 saltem quoad pl. Kamtsch. — »*Aster* Gm. Sib. II 186 No. 152» PENNANT, Arct. Zool. (1784) p. CXVI. — *Aster tataricus* LEDEB., Fl. Ross. II p. 475 quoad pl. Kamtsch. — *Aster Richardsonii* FEDTSCH., Fl. Il. Comm. p. 69.

South Kamtchatka: Shadutka volcano 1100 m. Aug. 2nd 1921 Hn No. 2586; Lake Tolmachovaja 600 m. July 13th 1922 Hn No. 3916; Bolsheredsk Bezais 1909; Toporkoff Island (= Starichkoff Island) Perfiljef 1911, do. Aug. 15th 1920 Hn No. 897; Hutor July 19th 1928 Malaise; Savoiko Komarov 1908, do. July 25th and Aug. 2nd 1928 W. Eyerdam; »Korjatskaja ostrochka» (= Korjaka) Vossnesensky 1848, do. Komarov 1908.

East Kamtchatka: The entrance of Avatcha Bay Perfiljef 1911; Avatcha volcano Perfiljef 1911, do. 675 m. July 30th 1920 Hn No. 625 a and b; Kichpinitch volcano Komarov 1909; Mt. Krasheninnikof Komarov 1909 (Hb. Holm.); Uzon Komarov 1909; the Kronoki Pass Komarov 1909; Klutchevskaja volcano Kurtashof 1909, do. 4900 feet Kozlovsky 1909; Ustj Kamtchatsk Aug. 5th 1925 Malaise No. 543, do. Aug. 1925 Malaise No. 544.

Commander Islands: Bering Island Morozevicz acc. to Fedtsch. loc. cit.

Central Kamtchatka: Kamtchatka vershina Komarov 1909 (Hb. Holm.); Kirganik Komarov 1909 (Hb. Holm.); Mashura Aug. 7th 1921 Hn No. 3505 (Malaise); Shtchapina Komarov 1909, do. July 28th 1921 Hn No. 3488 (Malaise); the foot of Kunchekla volcano Komarov 1909; Tolbatchik Komarov 1909; Kosyrevsk Grinop 1909; Klutchi Bezais 1908, do. July 20th 1926 Malaise No. 398.

West and North Kamtchatka: Chairusovaja Novikof 1909.

»Kamtchatka»: Merk, acc. to Herder loc. cit. Kastalsky, Kusmischeff and Levitzky, »Petropavlovsk Mertens», Peters, Rieder.

In South Kamtchatka *A. sibiricus* was only observed in the few localities enumerated above. It is apparently more common northwards.

In Kamtchatka this species occurs in a multitude of forms. In the lowlands of Central Kamtchatka forms occur coinciding with *A. sibiricus* L. *sensu stricto* (Comp. Ostenfeld & Resvoll in Nyt Mag. f. Naturvid. 54, 1916 p. 156), while in the mountains forms occur which more or less coincide with *A. sibiricus* var. *subintegerrimus* Trautv. (= *A. subintegerrimus* Ostenf. & Resv.). It is hardly possible, however, to claim any distinct line of demarcation between those two types in Kamtchatka, as the chief characteristics distinguishing them, viz., the breadth and form of the involucral bracts and the number and size of the teeth of the leaves, are found in every combination in the large material cited above. Practically every number represents a form that differs in some way from the others. The alpine forms are lower and often single-flowered. I have seen specimens from Alaska (for instance Illiamna Lake, Gorman No. 137 Hb. Holm.) which agree well with typical *A. sibiricus* and must be included in that species.

Type of distribution: Eurasiatic, transgressing into W. America.

Geographical area: (including *A. subintegerrimus*) Europe: One locality in central Norway, one in northern Finland, S. and E. Kola Penins., in the Urals southwards to Orenburg. Asia: at Yenisei from about 70° N. lat., from Boga-

nida R., lower Kolyma R. and Chukch Penins., southwards to Altai, northern Mongolia (some few localities), northern Amur prov., Ajan and southern Kamtchatka. America: at least W. Alaska. The very closely related (or partly identical) American *A. Richardsonii*, from Mackenzie southwards to Alberta and British Columbia.

716. ***Aster Tilesii*** Wikstr. in Acta Holm. (1822) p. 13.

Aster peregrinus Fedtsch., Fl. Îl. Comm. p. 68. — *Erigeron salsuginosus* (Richardson) Gray var. *unalaschcensis* (Less.) Macoun, Fernald in Rhodora 11 (1909) p. 141.

Commander Islands: Bering Island Dobrotvorsky 1881, acc. to Fedtsch. loc. cit. Dybovsky and Stejneger, Gudzenko 1910; Copper Island Dybovsky 1879 (sub *A. unalaschkensis*), Dobrotvorsky 1881, acc. to Fedtsch. loc. cit. Stejneger and Morozewicz, Aug. 26th 1921 Sandberg (Hb. Holm.).

The plants from the Commander Islands certainly belong to *A. Tilesii* Wikstr., the type specimen of which, collected by Tilesius, is preserved in Hb. Holm. (from Hb. Swartz). They are most probably also identical with *A. unalaschcensis* Less. (1831) which is treated by modern American botanists as a variety of *A. salsuginosus* Richards. (1823). The name *A. Tilesii* is used here as it is the oldest of those three names. At a still earlier date, however, the name *A. peregrinus* was given by Pursh to a plant which, like the other three ones, was collected at Unalashka and which must apparently be very close to our species. As I have seen no authentic specimens of it, and as the original description is too short and incomplete, I have not been able to decide whether it is identical with *A. Tilesii* or not. If the two are identical the name of the plant should be *A. peregrinus* Pursh.

Type of distribution: Northern Pacific.

Geographical area: Asia: Commander Islands. America: Aleutian Islands and southern coast of Alaska.

717. ***Erigeron acris*** L., Sp. pl. ed. I (1753) p. 863 *(acre)*.

Pennant, Arct. Zool. (1784) p. CXVI; ?Erman, Verzeichn. p. 57; Ledeb., Fl. Ross. II p. 488; Kudo. Fl. Paramush. p. 164. — »*Erigeron floribus ex ala foliorum prodeuntibus . . .*» Gmel., Fl. Sib. II p. 194.

Northern Kuriles: Paramushir Kudo 1920 acc. to Kudo loc. cit.

South Kamtchatka: Upper Ksudach R. 150 m. Aug. 4th 1921 Hn No. 2647; upper Kusingen R. 280 m. noted by Hn; the hot springs at Shadutka Aug. 12th 1922 Hn No. 4235; the hot springs at Bannaja 440 m. Sept. 12th 1921 Hn No. 3231; Starichkoff Island (= Toporkoff Island) Perfiljef 1911; Nikolajevsk Komarov 1908; Natchika Komarov 1908; »Südspitze von Kamtschatka« acc. to Erman loc. cit.

Central Kamtchatka: Kamtchatka vershina Komarov 1909; Anauna R. Sept. 5th 1926 Malaise No. 351 (doubtful form).

»Kamtchatka»: Langsdorff, Rieder No. 167.

This plant is rare in South Kamtchatka. I refer the specimens enumerated above to *E. acris*, chiefly as they have pilose involucral scales and stem. The material is too small to give any idea of its variation. MALAISE No. 351 is a peculiar form with very large heads, but similar forms occur also in the Scandinavian material of our species.

Type of distribution: Eurasiatic.

Geographical area: Europe: From Iceland and northern Scandinavia southwards. Asia: throughout Siberia to Kamtchatka and southern Japan. All that I have seen under the name of *E. acris* from America or from the Himalayas belong to other species.

718. ***Erigeron elongatus*** LEDEB., Fl. Altaica IV (1833) p. 91.

Erigeron Kamtschaticum DC., Prodr. V (1836) p. 290; LEDEB., Fl. Ross. II p. 488 (*kamtschaticus*); YABE & YENDO, Fl. Shimushu p. (196). — *Erigeron acris* β *asteroides* et η *kamtschaticus* HERDER, Pl. Radd. Monopet. No. 61 in Bull. Mosc. 38: 1 (1865) p. 392 et RADDE, Reisen III: 2 p. 24 quoad pl. Kamtsch. saltem pro maxima parte. — ?*Erigeron acris* var. *asteroides* YABE & YENDO, Fl. Shimushu p. (196). — *Erigeron acer* var. *elongatus* FEDTSCH., Fl. Îl. Comm. p. 69. — *Erigeron kamtschaticum* var. *hirsutum* KUDO, Fl. Paramush. p. 164.

Northern Kuriles: Paramushir T. MATSUBARA 1915 and KUDO 1920 acc. to KUDO loc. cit.; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Paratunka STUBENDORFF; Nikolajevsk KOMAROV 1908; Savoiko KOMAROV 1908, do. RAMENSKY 1908, do. July 16th and 28th 1928 W. EYERDAM, do. Aug. 15th 1928 MALAISE; Korkaja KOMAROV 1908.

East Kamtchatka: Petropavlovsk DOBROTVORSKY 1881, do. Aug. 14th 1921 HN No. 872; Lake Kalashtyrka Aug. 18th 1923 P. T. NOVOGRABLENOF (Hb. Holm.); between Petropavlovsk and Avatcha volcano 350 m. Aug. 6th 1921 HN No. 772; Lake Kronoki KOMAROV 1909.

Commander Islands: Bering Island MOROZEWICZ acc. to FEDTSCH. loc. cit.; Copper Island DOBROTVORSKY.

Central Kamtchatka: Shtchapina KOMAROV 1909; Tolbatchik KOMAROV 1909, do. BEZAIS 1908 (Hb. Holm.); Klutchi BEZAIS 1908; Jelovka BEZAIS 1909.

West and North Kamtchatka: Krutugorovaja ZELENIN 1908; Tigil GUDZENKO 1910.

»Kamtchatka»: MERK (Hb. LEDEB. sub *E. kamtschaticus*), collector unknown (Hb. MEYER sub *E. kamtschaticus*), ESCHSCHOLTZ, RASTARGUJEF, STEWART, KUSMISCHEFF, acc. to HERDER loc. cit. LEVITSKY, MERTENS and POSTELS, RIEDER.

Kamtchatka specimens which I refer to this species have sometimes slightly pilose stem and radical leaves with scattered teeth. For this reason they have been described as a separate species, *E. kamtschaticus*, but I cannot find that it is possible to claim any constant characteristics distinguishing it from *E. elongatus*. Hairy stem and toothed leaves sometimes occur, however,

even in the Scandinavian material of *E. elongatus*. Some of the specimens agree exactly, as far as I can see, with typical *E. elongatus* LEDEB. Possibly the more hairy forms constitute a Pacific race of the species.

Type of distribution: ?Circumpolar.

Geographical area: Owing to the complicated synonyms, and as the many puzzling forms belonging to this group are not yet critically revised, it is not possible to give the area in detail. *E. elongatus* is distributed from Scandinavia eastwards to Kamtchatka and Japan. I have seen specimens from Western America which must be regarded as belonging to our species. Possibly it occurs also in E. America.

719. ***Erigeron unalaschkensis*** (DC.) VIERHAPP. in Bot. Centralbl. XIX: 2 (1906) Beiheft. p. 492.

Erigeron uniflorus KJELLMAN, Komm. faner. fl. p. 292; FEDTSCH., Fl. Îl. Comm. p. 69 saltem pro parte.

Commander Islands: Bering Island KJELLMAN.

Central Kamtchatka: Anauna R. Sept. 5th 1926 MALAISE No. 352.

West and North Kamtchatka: Karaginsk Island LOGINOVSKI 1910 (sub *Erigeron uniflorus*).

FEDTSCHENKO reports »*Erigeron uniflorus*» as having been collected on Copper Island by MOROZEWICZ. Without seeing the specimen it is impossible to say whether it belongs to *E. unalaschkensis* or to *E. uniflorus* L. The latter is a circumpolar plant which might well be expected within our area (Comp. VIERHAPPER loc. cit.).

Type of distribution: Circumpolar.

Geographical area: Europe: known from Iceland, Spitzbergen, northern Scandinavia (rare), Vaigatch. Asia: Tajmyr R., Chukch Penins., northern Kamtchatka and Commander Islands. America: arctic America southwards to Unalashka, Montana and Labrador. E. and W. Greenland. In the Rocky Mts. the very closely related *E. melanocephalus*.

720. ***Antennaria alpina*** (L.) GAERTN., De Fruct. et Sem. plant. II (1807) p. 410.

[*Gnaphalium alpinum* L., Sp. pl. ed. I (1753) p. 856.]

South Kamtchatka: Mt. Krashni gor, Lake Natchiha KOMAROV 1908.

As my opinion on this group has changed since I saw the *Antennaria* material in Leningrad, and as I have not had the material available at the final revision I must confine myself to stating that a plant of this type is present in Kamtchatka and leave open the question whether it belongs to the head-form, to var. *Friesiana* TRAUTV. (which seems most probable) or to a separate form. Compare also under *A. monocephala*.

Type of distribution: ?

Geographical area: *A. alpina* including var. *Friesiana* Europe: Iceland, N. Scandinavia. Asia: Arctic Eastern Asia and Kamtchatka. America: from Alaska and the Arctic Archipelago to Labrador, southwards to British Columbia and Manitoba. E. and W. Greenland.

721. ***Antennaria dioica*** (L.) Gaertn., De Fruct. et Sem. plant. II (1807) p. 410 tab. 167 fig. 3.

Ledeb., Fl. Ross. II p. 612; Yabe & Yendo, Fl. Shimushu p. (197); Fedtsch., Fl. Îl. Comm. p. 74; Kudo, Fl. Paramush. p. 164; Kom., Voy. Kamtch. pp. 269, 453. — »*Gnaphalium caule simplicissimo . . .*» Gmel., Fl. Sib. II p. 105. — [*Gnaphalium dioicum* L., Sp. Pl. ed. I (1753) p. 850]; Georgi, Beschreib. III: 5 p. 1237; Hook. & Arnott in Bechy's Voy. p. 115; Herder, Pl. Radd. Monopet. No. 137 in Bull. Mosc. 40: 1 (1867) p. 412 et Radde, Reisen III: 2 p. 99.

Northern Kuriles: Paramushir Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka West coast June 19th 1920 Hn No. 53; N. of Ozernaja village in heath noted by Hn; N. of Illina volcano noted by Hn; near the mouth of Javina R. noted by Hn; below the junction of Golygina and Ksudach rivers noted by Hn; Golygina village in heath noted by Hn; »the volcanic desert» at Shadutka volcano noted by Hn; Listvenichnaja Bay Rieder 1831; Gorelaja volcano 800 m. July 14th 1922 Hn No. 3952; middle Tolmachovaja R. in heath noted by Hn; middle Karymchina R. 220 m. Sept. 7th 1921 Hn No. 3075; the hot springs at Bannaja R. 440 m. Sept. 12th 1921 Hn No. 3222; »Alochkin tundra» upper Paratunka R. Komarov 1908; mt. »Krasni Gor» Lake Natchika Komarov 1908 (mixed in a sheet of *Antennaria alpina*); Nikolajevsk Komarov 1908 (Hb. Holm.); Hutor W. Eyerdam 1928; between Hutor and Savoiko Rubinski 1908; Savoiko June 27th and July 12th 1928 W. Eyerdam; sources of Poperochnaja R. Savitch 1908; Korjaka Komarov 1908.

East Kamtchatka: Petropavlovsk June 18th 1928 W. Eyerdam; the Kalashtyrka valley Komarov 1909; between Petropavlovsk and Savoiko Grinop 1909, do. July 9th 1920 Hn No. 379 a and b; between Petropavlovsk and Avatcha volcano 350 m. Aug. 24th 1920 Hn No. 1062 and 1067 (A. 16); Avatcha volcano 1180 m. Aug. 2nd 1920 Hn No. 717; mt. Krasheninnikof Komarov 1908; Ustj Kamtchatsk June 1925 Malaise No. 544.

Commander Islands: Bering Island acc. to Gmel. loc. cit. (compare below).

Central Kamtchatka: Malka Komarov 1909; between Malka and Ganala Grinop 1909; Gremushej R. Komarov 1908; Korjatskaja volcano Komarov 1908; Ganala Stewart; the Ganala »tundra» Komarov 1909; 20 verst from Ganala Grinop 1909; near Shtchapina acc. to Kom. loc. cit. p. 269; Kresti July 5th 1921 Hn No. 3416 (Malaise); Klutchi Afanasejev 1909, do. Bezais, do. 500 m. June 14th 1921 Hn No. 3339 (Malaise), do. June 23rd 1921 Hn No. 3375 (Malaise).

West and North Kamtchatka: Krutugorovaja ZELENIN 1908; Tigil LEVITZKY 1848, do. GUDZENKO 1910.

»Kamtchatka»: ESCHSCHOLTZ, KUSMISCHEFF.

Noted in the following association:
In *Vaccinium—Empetrum*—Moss ass.:
Single (A. 16).

In South Kamtchatka *A. dioica* occurs here and there in the heaths up to an altitude of more than 1100 m. The material enumerated above includes several forms with higher or lower growth, broader and narrower involucral scales and with denser or more sparse indumentum. In these respects the Kamtchatka plant shows about the same wide variation as the Scandinavian, and could not be identified with any of the many closely related American species. Judging from the description, *A. insularis* GREENE described from the Alaska coast might possibly be a form of our plant corresponding to the low-grown arctic forms such as HN No. 53, but I have not seen any specimens of that species. The occurrence of our plant in the Commander Islands is doubtful. The only published report is that of GMELIN loc. cit., which was evidently founded on some information supplied by STELLER. In his unpublished catalogue of the plants from Bering Island STELLER enumerates »*Elichrysum montanum flore rotundiore subpurpureo*» and »*flore candido*». I do not know whether GMELIN's report is based on that record only, or whether STELLER also brought home specimens of the plant that GMELIN had seen.

Type of distribution: Eurasiatic.

Geographical area: From northernmost Scandinavia, Kola penins. and the arctic Russian mainland, southwards to central Spain, northern Italy and Caucasus. Asia: from Jalmal, at Yenisei from about 69° N. lat., from Verchojansk distr. and Kolyma R., southwards to Armenia, northern Mongolia, northern Amur Prov., Saghalin and northern Yezo. In America: several closely related species.

722. ***Antennaria monocephala*** DC., Prodr. VI (1837) p. 269.

Central Kamtchatka: Anauna R. Aug. 18th 1926 MALAISE No. 345.

This plant differs from *A. alpina* chiefly in its solitary head, its more mucronate radical leaves, and its short stolons. The *A. alpina* group is, however, so confused in these parts of the world that it seems impossible to clear up the probably comparatively complicated situation without a monographical study of all its puzzling forms.

Type of distribution: ?Northern Pacific.

Geographical area: Asia: Kamtchatka, Chukch Penins. America: Alaska to Alberta, southwards to British Columbia (acc. to RYDBERG). In America: several closely related species (*A. angustata* GREENE, *A. glabrata* (VAHL) GREENE and others). Tomentose forms which sometimes occur among the Greenland material of the latter species (Godhavn E. EKMAN 1923 Hb. Holm.) are very similar.

723. ***Leontopodium*** cfr. ***linearifolium*** HANDEL-MAZZETTI.

HANDEL-MAZZETTI in Bot. Zentralbl. 44: 2 (1927) Beiheft p. 100.

East Kamtchatka: Ploskaja volcano, »pervaja na dolu sopotchka» PROTOPOPOF 1909.

In his monograph on the genus *Leontopodium* loc. cit. HANDEL-MAZZETTI expresses his doubts as to the identity of the Kamtchatka plant, which to this day is known only through some few specimens, all collected in one locality. One might expect that the Kamtchatka plant, if it is not a separate species, should belong either to *L. Palibinianum* BEAUVD. or to *L. kurilense* TAKEDA, which are the species that come closest to our area in the north and the south respectively. That it should belong to the far more southern species *L. linearifolium* seems improbable. The material available at present is, however, too small to settle the question as to the identity of our plant.

724. ***Anaphalis margaritacea*** (L.) BENTH. & HOOK., Genera plant. II (1876) p. 303.

var. ***occidentalis*** GREENE

MAXIM. in Mél. Biol. XI (1881) p. 235; YABE & YENDO, Fl. Shimushu p. (196); FEDTSCH., Fl. Îl. Comm. p. 74; KUDO, Fl. Paramush. p. 165 (also f. *latifolia*). — »*Gnaphalium foliis lineari-lanceolatis, acuminatis, alternis . . .*» GMEL., Fl. Sib. II p. 107. — *Gnaphalium margaritaceum* L., Sp. pl. ed. I (1753) p. 850; PENNANT, Arct. Zool. (1784) p. CXVI; GEORGI, Beschreib. III: 5 p. 1237; HERDER, Pl. Radd. Monopet. No. 138 in Bull. Mosc. 40: 1 (1867) p. 415 et RADDE, Reisen III: 2 p. 102 (β *intermedium* s. *Kamtschaticum*). — *Antennaria margaritacea* (L.) R. BR., LESSING in Linnaea VI (1831) p. 222; LEDEB., Fl. Ross. II p. 613.

Northern Kuriles: Paramushir C. TARO 1892, S. YOKOYAMA 1893, KUDO 1920 all acc. to KUDO loc. cit.; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka, west coast June 24th 1920 HN No. 127 b (sterile shoots); lower Ozernaja R. Aug. 12th 1921 HN No. 2834 (A. 100); Sahach in meadow noted by HN; middle Opala R. 100 m. July 27th 1921 HN No. 2444; Bolsheredsk KOMAROV 1908 (Hb. Berol.); Paratunka KOMAROV 1908; Korjaka valley KOMAROV 1908.

East Kamtchatka: »Majak» PERFILJEF 1911; between Sierroglaska and Petropaplovsk July 24th 1928 W. EYERDAM; Petropavlovsk MERTENS, do. VOSSNESENSKY, do. DOBROTVORSKY, do. KOMAROV 1908, do. GUDZENKO 1910, do. PERFILJEF 1910, do. July 19th 1920 HN No. 500, do. July 22nd and 27th and Aug. 10th 1928 W. EYERDAM; the Nalutcheva Lake PERFILJEF 1910; the mouth of Jurtochnaja R. KOMAROV 1908; Klutchevskaja volcano BEZAIS 1909 (Hb. Berol.).

Commander Islands: Bering Island STELLER acc. to GMEL. loc. cit., Copper Island DYBOVSKY 1879, GREBNITZKY 1894 and acc. to FEDTSCH. loc. cit. STEJNEGER.

West and North Kamtchatka: Kol RUBINSKI 1908; Krutugorovaja ZELENIN 1908; Tigil LEVITSKY (doubtful, not original label).

»Kamtchatka»: KRASCHENINNIKOF acc. to GMEL. loc. cit., ESCHSCHOLTZ, LUBARSKY, acc. to HERDER loc. cit. RASTARGUJEFF, KASTALSKY (Hb. Berol.), KUSMISCHEFF, »Exp. LÜTKE 1828—29», POSTELS, PETERS 1831, RIEDER (Hb. Holm., Hb. Berol.).

Noted in the following association:

In *Thalictrum—Sanguisorba—Carex* ass.:
Sparse (A. 100).

In South Kamtchatka *A. margaritacea* occurs here and there in the meadows. The specimens are usually broader-leaved (7—20 mm. — KUDO reports up to 30 mm.) than the eastern American plant. The leaves are glabrous or slightly floccose above, and the branches of the corymbs are comparatively short. They should therefore be referred to var. *occidentalis* GREENE.

Type of distribution: American, transgressing into E. Asia.

Geographical area: Asia: from Shantar Island, Saghalin and Kamtchatka southwards to Formosa; also in Ussuri and Corea. In Central China, the Himalayas and Ceylon, the closely related *A. cinnamomea* CLARKE, forms transitional to which possibly occur. America: from Alaska 54° N. lat. to Labrador 53° N. lat., southwards to California 36° N. lat. and Massachusetts 42° N. lat. In E. America also the narrow-leaved head-form.

725. ***Gnaphalium uliginosum*** L., Sp. pl. ed. I (1753) p. 856.

HERDER, Pl. Radd. Monopet. No. 133 in Bull. Mosc. 40: 1 (1867) p. 406 et RADDE, Reisen III: 2 p. 93.

South Kamtchatka: Bolsheredsk KOMAROV 1908; the hot springs at Bannaja 440 m. Sept. 12th 1921 HN No. 3214 (a single specimen).

East Kamtchatka: The mouth of Jurtochnaja R. KOMAROV 1909.

Central Kamtchatka: Malka STUBENDORFF 1849; Kresti BEZAIS 1908.

»Kamtchatka»: KUSMISCHEFF acc. to HERDER loc. cit., RIEDER 1833.

This species apparently occurs very scattered in Kamtchatka (in connection with hot springs?). Although I looked for more material I found only a single specimen at the hot springs at Bannaja — the only place, in fact, where I saw the plant.

Type of distribution: Circumpolar.

Geographical area: Europe: From Iceland, central Finland and Perm prov., southwards to southern France, southern Italy, Crimea and Caucasus. Asia: at Yenisei from about 70° N. lat., from Verchojansk distr. and Kamtchatka, southwards to Armenia, Semipalatinsk prov., northern Mongolia, Corea and Honshu. America: from British Columbia to Newfoundland southwards to California and Virginia. S. Greenland.

726. ***Inula britannica*** L., Sp. pl. ed. I (1753) p. 882 (*Britannica*).

East Kamtchatka: Ustj-Kamtchatsk Aug. 25th 1927 MALAISE; the Chartchina Lake BEZAIS 1909; Jelovka BEZAIS 1909.

Type of distribution: Eurasiatic.

Geographical area: In a multitude of forms: Europe: from France, Denmark, southern Sweden, Olonetz, and Perm provinces, southwards to N.E. Spain, Italy, Crimea and Caucasus. Asia: at Yenisei from about 69° N. lat., from lower Lena R. and Kolyma, southwards to Syria, northern Persia, Turkestan, Mongolia, central China and southern Japan (also in N.E. Kamtchatka). (Not known from south and central Kamtchatka, nor from the Kuriles).

727. ***Bidens radiata*** THUILL., Fl. envir. Paris ed. II (1799) p. 432.

HERDER, Pl. Radd. Monopet. No. 78 in Bull. Mosc. 38: 1 (1865) p. 399 et RADDE, Reisen III: 2 p. 31.

East Kamtchatka: Hot springs at Uzon crater KOMAROV 1909 (sub *B. tripartita*).

»Kamtchatka»: »Herb. PALLAS» acc. to HERDER loc. cit.

Type of distribution: Eurasiatic.

Geographical area: Europe: From Denmark, northern Sweden and Finland and northern Orenburg, southwards to France, southern Germany, Austria and southern Russia. Asia: throughout Siberia to Vilju distr., Amur and Ussuri provinces, Saghalin, Yezo, the southern Kuriles and Kamtchatka.

Achillaea borealis BONG.

In Hb. Acad. Petrop. there is preserved a specimen belonging to this species labelled »Petropavlosk MERTENS». As MERTENS' plants were not always correctly labelled the plant might equally well have been collected in Alaska. *A. borealis* is otherwise not known from our area.

Achillaea decumbens LAM.

LAM. in POIR., Encycl. Méth. Bot. I p. 27; LEDEB., Fl. Ross. II p. 537.

LAMARCK reports this species as having been cultivated from seeds collected in Kamtchatka and brought home by COOK's Expedition. The plant is otherwise not known from our area.

Achillaea impatiens L.

HERDER, Pl. Radd. Monopet. No. 79 in Bull. Mosc. 38: 1 (1865) p. 408 et RADDE, Reisen III: 2 p. 40; HEIMERL in Denkschr. Akad. Wien XLVIII (1884) p. 185.

HERDER'S report reads »aus Kamtschatka (Herb. PALLAS)». The plant is otherwise not known from our area.

728. ***Achillaea Millefolium*** L., Sp. pl. ed. I (1753) p. 899.

East Kamtchatka: Petropavlovsk GUDZENKO 1910, do. PERFILJEF 1910, do. Aug. 17th 1920 HN No. 930, do. July 22nd 1928 W. EYERDAM.

This plant was certainly introduced into Kamtchatka. Compare under *A. sibirica*.

Type of distribution: Circumpolar (partly introduced).

Geographical area: Throughout Europe and Asia, at Yenisei from about 70° N. lat. from Verchojansk distr., southwards to Asia Minor, Kashmir, China and Yezo. America: from British Columbia and Newfoundland, southwards to Colorado and Virginia. S. Greenland.

729. ***Achillaea Ptarmica*** L., Sp. pl. ed. I (1753) p. 898.
subsp. ***macrocephala*** (RUPR.) HEIMERL.

HERDER, Pl. Radd. Monopet. No. 78 in Bull. Mosc. 38: 1 (1865) p. 406 et RADDE, Reisen III: 2 p. 38 (var. *speciosa*); HEIMERL in Denkschr. Acad. Wien XLVIII (1884) p. 172 (subsp. *Eu-Ptarmica* and subsp. *Macrocephala*); YABE & YENDO, Fl. Shimushu p. (197) (var. *speciosa*); FEDTSCH., Fl. Îl. Comm. p. 70 (var. *Beringiana*), KUDO, Fl. Paramush. p. 166 (var. *speciosa*). — »*Achillea foliis integris, minutissime serratis . . .*» GMEL., Fl. Sib. II p. 196 quoad pl. ex insula Beringii. — *Achillaea speciosa* ERMAN, Verzeichn. p. 58. — *Achillaea grandiflora* ERMAN, Verzeichn. p. 58. — *Anthemis ptarmicaefolia* ERMAN, Verzeichn. p. 58. — *Ptarmica speciosa* LEDEB., Fl. Ross. II p. 530 quoad pl. Kamtsch. — *Ptarmica grandiflora* LEDEB., Fl. Ross. II p. 531 quoad pl. Kamtsch. — *Achillaea macrocephala* RUPR. in Beitr. Pflanzenk. Russ. Reich II (1845) p. 41.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: S. of the mouth of Kambolnaja R. RUBINSKI 1909; Kurile Lake noted in meadow by HN; the mouth of Ozernaja R. GUDZENKO 1910; N. of the mouth of Ozernaja R. in meadow noted by HN; N. of Illina volcano noted by HN; between Javina and Kochegochek noted in A. 91, A. 92; Sahach noted in A. 192; upper Kusingen R. noted in A. 190; middle Kusingen R. noted by HN; S. of Golygina village noted by HN; Golygina village VOSSNESENSKY, do. noted by HN; middle Ksudach R. noted in A. 87; upper Ksudach R. noted in A. 84, A. 85; N. of Opala village noted by HN; the western Shadutka R. in meadow noted by HN; Lake Sterbot noted in A. 215, A. 216; between Lake Sterbot and Lake Kambolnoje noted by HN; upper Savan R. 250 m. Aug. 1st 1921 HN No. 2556 b (A. 79); N.W. slope of Assatcha mts. noted in A. 177; Assatcha mts. at the sources of Opala R. July 31st 1922 HN No. 4075 (A. 185); the mouth of »Tsaots» R. in Opala R. RUBINSKI 1909; upper Udoshk R. noted in A. 78 b; near the hot springs at upper Opala R. noted in A. 180, A. 181; Akhomten Bay 500 m. Sept. 13th 1920 HN. No. 1372; N.W. of Opala volcano noted in A. 67, A. 69; Lake Tolmachovaja 600 m. July 13th 1922 HN No. 3917; the junction of Tolmachovaja rivers noted in A. 157; upper Abshen R., the first flower for the season noted on July 17th 1921 by HN; lower Bolshaja R. noted in A. 105, A. 107 middle Karym-

china R. in *Angelica*-meadow noted by Hn; Bolsheredsk noted by Hn; lower Bannaja R. in *Angelica*-meadow noted by Hn; the hot springs at Siku R. noted in A. 122; the hot springs at Bannaja R. 440 m. Sept. 12th 1921 Hn No. 3208; »Paratun» Stubendorff; Bogatyrjovka Perfiljef 1910; the western shore of Lake Natchika Komarov 1908; Nikolajevsk Aug. 11th 1920 Hn No. 844; Avatcha village »Hb. Pallas, Hb. Fisch.»; the hot springs at Natchika Vossnesensky 1847 (sub *A. grandiflora*), do. Komarov 1908, do. Sept. 2nd 1921 Hn No. 2990; Savoiko Komarov 1908, do. June 27th and July 12th 1928 W. Eyerdam; Korjaka Komarov 1908.

East Kamtchatka: Petropavlovsk Dybovsky 1879, do. Perfiljef 1909; between Petropavlovsk and Korjatskaja volcano Aug. 12th 1928 W. Eyerdam; Lake Assabatch Aug. 15th 1925 Malaise No. 545; Nishne Kamtchatsk Vossnesensky (sub *A. grandiflora*).

Commander Islands: Bering Island Steller acc. to Gmel. loc. cit., Dybovsky 1879, Morozevicz acc. to Fedtsch. loc. cit.; Copper Island Stejneger and Dobrotvorsky acc. to Fedtsch. loc. cit.

Central Kamtchatka: Sharomsk Protopopof 1908; Mashura Protopopof 1908; Shtchapina Komarov 1909; 8 verst from Shtchapina on the path to Kronoki Komarov 1909; Ulovioj R. Bezais 1908 (Hb. Holm.); Lake Kuraratchnoje Bezais 1909 (Hb. Holm.).

West and North Kamtchatka: Utka Rubinski 1908; Krutugorovaja Zelenin 1908; Tigil acc. to Erman loc. cit., do. Levitsky (not original label).

»Kamtchatka»: Langsdorff acc. to Herder loc. cit., Liboschütz »Herb. Fisch. *grandis* m.», Lubarsky, Rastargujeff, Kusmischeff, Stewart, Kastalsky (sub *A. macrocephala*), »Petrop. Mertens», Peters 1831, Rieder Kamt. ad Erman» (Hb. Berol. sub *Ptarmica speciosa*).

Noted in the following associations:

In *Filipendula—Calamagrostis—Sanguisorba* ass.:
Single (A. 85).

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 67, A. 69, A. 78 b, A. 79, A. 84, A. 91, A. 92, A. 105, A. 107, A. 190); Sparse (A. 185).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 122).

In *Betula platyphylla—Thalictrum—Carex* ass.:
Single (A. 157).

In *Betula Ermani—Filipendula—Dryopteris* ass.:
Sparse (A. 180).

In *Carex—Sanguisorba*—Moss ass.:
(Single A. 87, A. 181); Sparse (A. 192).

In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Single (A. 215, A. 216).

In *Artemisia arctica—Solidago—Salix* »*arctica*» ass.:
Single (A. 177).

In South Kamtchatka this plant is common in all kinds of lowland meadows. It occurs also in the subalpine meadows of the western coast and occasionally even in those of the lower alpine region. It is more rarely found in the *Betula Ermani* forest. It flowers from the middle of July to the middle of September. The Kamtchatka plant here referred to subsp. *macrocephala* differs from typical *A. Ptarmica* in its large heads and in its involucral scales with broad dark-brown margin. It hardly seems possible to draw any sharp line of demarcation between it and the head-form. The plant is more abundant in the coastal belt, and specimens from the central part of the country are more like the head-form, and some of them could equally well be referred to it. Subsp. *macrocephala* may be said to be the Pacific representative of *A. Ptarmica.*

Type of distribution: The entire species: Eurasiatic. Subsp. *macrocephala:* Asiatic Pacific.

Geographical area: The head-form: Europe: from Central Scandinavia and Finland southwards to northern Spain, northern Italy and southern Russia. Asia: throughout Siberia to Jakutsk prov., Amur prov. and Ussuri. Subsp. *macrocephala:* Kamtchatka, the Kuriles, Saghalin and Yezo. In Siberia westwards to Finland, East Prussia and Hungary the closely related *A. cartilaginea* LEDEB.

730. ***Achillaea sibirica*** LEDEB., Ind. Sem. Hort. Dorpat (1811) (non vidi).

HERDER, Pl. Radd. Monopet. No. 77 in Bull. Mosc. 38: 1 (1865) p. 405 et RADDE, Reisen III: 2 p. 37; HEIMERL in Denkschr. Akad. Wien XLVIII (1884) p. 187 (subsp. *Camtschatica* (RUPR.) HEIMERL); YABE & YENDO, Fl. Shimushu p. (197); FEDTSCH., Fl. Îl. Comm. p. 70; KUDO, Fl. Paramush. p. 165. — *Ptarmica sibirica* LEDEB., Fl. Ross. II p. 528.

Northern Kuriles: Paramushir C. TARO 1892, I. KODAMA 1893 and KUDO 1920 all acc. to KUDO loc. cit.; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka collected by Cosacks 1909, do. BJELOUSSOF 1914, do. June 19th 1920 HN No. 60, do. June 24th 1920 HN No. 128; S. of Kambolnaja R. RUBINSKI 1909; the mouth of Kambolnaja R. RUBINSKI 1909; Kurile Lake Aug. 27th 1922 HN No. 4416; Ozernaja R. 30 verst from the mouth RUBINSKI 1909; Ozernaja village noted by HN; the shore between Ozernaja and Javina Aug. 13th 1921 HN No. 2861; Javina noted by HN; Golygina village Aug. 8th 1921 HN No. 2756; Lake Sterbot noted in A. 216; between Sterbot and Lake Kambolnoje noted by HN; S. of Sykovaja Sept. 13th 1922 HN No. 4575 (A. 217); near the mouth of Bolshaja R. noted by HN; Bolsheredsk KOMAROV 1908; Apatcha noted by HN; Cape Kutcha, Tarja Bay KOMAROV 1908; Bogatyrjovka July 16th 1920 HN No. 440; Starichkoff Island (= Toporkoff Island, Sarannaja Bay) PERFILJEF 1911 (Hb. Holm.); Nikolajevsk KOMAROV 1908; between Hutor and Savoiko KOMAROV

1908; Savoiko KOMAROV 1908, do. July 26th 1928 W. EYERDAM; Korjaka KOMAROV 1908.

East Kamtchatka: The entrance of Avatcha Bay PERFILJEF 1911; Petropavlovsk MERTENS (sub *A. camtschatica* RUPR. and *A. sibirica* subsp. *camtschatica* HEIMERL), do. VOSSNESENSKY 1846, do. DOBROTVORSKY 1881, do. PERFILJEF 1910, do. July 19th 1920 HN No. 501, do. Aug. 16th 1920 HN No. 985 b, do. Aug. 20th 1922 P. T. NOVOGRABLENOF; Lake Nalutcheva PERFILJEF 1910; Avatcha volcano 700 m. July 31st 1920 HN No. 637; the mouth of Jurtochnaja R. KOMAROV 1909; the mouth of Tishaja R. KOMAROV 1909; Uzon crater KOMAROV 1909; Lake Kronoki KOMAROV 1909 (Hb. Holm.); Lake Assabatche Aug. 15th 1925 MALAISE No. 547; Ustj-Kamtchatsk PROTOPOPOF 1909, do. July 1923 MALAISE No. 548, do. Aug. 25th 1925 MALAISE No. 546.

Commander Islands: Bering Island DYBOVSKY 1879 and acc. to FEDTSCH. loc. cit. STEJNEGER and MOROZEWICZ; Copper Island DOBROTVORSKY 1881.

Central Kamtchatka: Mashura PROTOPOPOF 1908; Shtchapina KOMAROV 1909; Klutchi BEZAIS 1908, do. AFANASEJEV 1909, do. PROTOPOPOF 1909.

West and North Kamtchatka: Krutugorovaja ZELENIN 1908; Chairusovaja NOVIKOF 1909; between Tigil and Sedanka BEZAIS 1909; Tigil LEVITSKY 1848, do. BEZAIS 1909; Uka Hb. Sapporo; Karaga Hb. Sapporo; Karaginsk Island GUDZENKO 1910.

»Kamtchatka»: »Hb. PALLAS, Hb. FISCH.»; ESCHSCHOLTZ, RASTARGUJEFF, STEWART acc. to HERDER loc. cit.; KASTALSKY (Hb. Berol. sub *A. millefolium*); POSTELS and PETERS acc. to HERDER loc. cit., RIEDER.

Noted in the following association:
In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Single (A. 216); Sparse (A. 217).

In South Kamtchatka *A. sibirica* is common in the sub-alpine meadows along the coast. Otherwise it occurs also inland in villages or on paths. It was not observed in the uninhabited part of the country. *A. sibirica* is here taken in its wide sense. It occurs in a multitude of types which it is hardly possible to divide into smaller units without a monographical treatment of forms from the whole area of the species. HEIMERL loc. cit. divides the species into five subspecies, which, however, do not comprise all forms. Some of the specimens from the vicinity of Petropavlovsk (for instance HN No. 501), where also *A. millefolium* occurs, might be suspected of being hybrids with that species. In the southern part of our area specimens occur (HN No. 2756, RIEDERS specimen and others) with densely yellowish-brown tomentose inflorescence, involucral scales with broad brown margin, and very broad leaves. Most of the specimens from Central and N.E. Kamtchatka, on the other hand, have more narrow leaves with short and only slightly serrulated primary divisions, narrow brown margin on the involucral scales and slightly villose corymbs. Some of the specimens from Savoiko have ray-flowers with pink rays.

Type of distribution: Bicentric: Eastern Asiatic—Western American and Eastern American.

Geographical area: In many forms: Asia: From the Eastern Sayan Mts., Vilju distr., Verchojansk distr. and Anadyr, southwards to Mongolia, central China and southern Japan. America: (reported as *A. multiflora* HOOK. which is taken by HEIMERL loc. cit. as a synonym for *A. sibirica* — a view confirmed by FERNALD in Rhodora 31 1929 p. 219) from Alaska to Mackenzie and Saskatchewan, also on Gaspé penins. (acc. to FERNALD loc. cit.).

Matricaria inodora L., Fl. Suec. ed. II (1755) p. 297.

East Kamtchatka: Petropavlovsk KOMAROV 1908, do. Aug. 28th 1922 P. T. NOVOGRABLENOF (Hb. Holm.).

This plant occurs occasionally introduced at Petropavlovsk.

731. ***Matricaria suaveolens*** (PURSH) BUCHEN., Fl. Brem. ed. 4 (1894) p. 142 (non L., non KOCH).

[*Santolina suaveolens* PURSH, Fl. Am. Sept. (1814) p. 520.] — *Artemisia matricarioides* LESS., ERMAN, Verzeichn. p. 58. — *Matricaria discoidea* DC., LEDEB., Fl. Ross. II p. 544; HERDER, Pl. Radd. Monopet. No. 82 in Bull. Mosc. 38: 1 (1865) p. 409 et RADDE, Reisen III. 2 p. 41; FEDTSCH., Fl. Îl. Comm. p. 71; KOIDZ. in Bot. Mag. Tokyo 25 (1911) p. 221. — *Matricaria matricarioides* PORTER, KUDO, Fl. Paramush. p. 166.

Northern Kuriles: Paramushir KUDO 1920.

South Kamtchatka: Ozernaja village noted by HN; Javina village RUBINSKI 1909, do. noted by HN; Golygina village noted by HN; Opala village noted by HN; Bolsheredsk Aug. 22nd 1921 HN No. 2908; Apatcha village noted by HN; the hot springs at Siku R. noted by HN; Paratunka STUBENDORFF 1849, do. KOMAROV 1908, do. June 17th 1921 HN No. 1734; Bogatyrjovka July 16th 1920 HN No. 447 b; Avatcha village July 20th 1920 HN No. 521; Natchika village noted by HN; between Natchika and Korjaka on the path noted by HN; Savoiko July 9th 1920 HN No. 356 b, do. July 15th 1928 W. EYERDAM; Korjaka village noted by HN.

East Kamtchatka: Petropavlovsk KOMAROV 1908.

Commander Islands: Bering Island KJELLMAN, acc. to FEDTSCH. loc. cit. STEJNEGER, GREBNITZKY and MOROZEVICZ, acc. to KOIDZ. loc. cit. YOKOYAMA, GUDZENKO 1910; Copper Island DYBOVSKY 1879.

Central Kamtchatka: Mashura Aug. 9th 1921 HN No. 4511; Tolbatchik GRINOP 1909; Klutchi BEZAIS 1908.

West and North Kamtchatka: Chairusovaja NOVIKOF 1909.

»Kamtchatka»: LANGSDORFF, ESCHSCHOLTZ and STEWART acc. to HERDER loc. cit., RASTARGUJEFF, KASTALSKY, KUSMISCHEFF, RIEDER.

M. suaveolens is common in the villages of South Kamtchatka. It has certainly been introduced into the country and is not indigenous there, as is

often stated in literature. It evidently came to Kamtchatka very early as it was already collected by LANGSDORFF in 1804. The plant has apparently spread from its Western American home both to the east and to the west. It is still rare in Central Siberia, but more common both in the eastern and in the western parts of that country.

Type of distribution: Circumpolar, partly introduced.

Geographical area: Indigenous in western N. America. Introduced and partly naturalized throughout N. America, Europe and Siberia.

732. ***Chrysanthemum arcticum*** L., Sp. pl. ed. I (1753) p. 889.

GEORGI, Beschreib. III: 5 p. 1251; HOOK. & ARNOTT in Beechy's Voy. p. 116; YABE & YENDO, Fl. Shimushu p. (196); BARRETT-HAMILTON, A visit to Karaginsk Island p. 293; MAEKAWA in Transact. Sapporo Nat. Hist. Soc. VIII (1921) p. 5; KUDO, Fl. Paramush. p. 167 (var. *kurilense*, var. *Gmelini*, var. *palmatifidum*, var. *flabelliforme*). — »*Pyrethrum foliis longe petiolatis, palmatis . . .*» GMEL., Fl. Sib. II p. 203 tab. 84. — »*Pyrethrum* A.B. GM. Sib. II 203 No. 170»; PENNANT, Arct. Zool. (1784) p. CXVI. — »*Chrysanthemum* mit grosser Blüthe und saftreichen dreigezähnten Blättern» MERTENS, Bemerk. Fl. Koragins p. 62. — *Leucanthemum arcticum* DC., LEDEB., Fl. Ross. II p. 541; HERDER, Pl. Radd. Monopet. No. 86 in Bull. Mosc. 38: 1 (1865) p. 415 et RADDE, Reisen III: 2 p. 47; FEDTSCH., Fl. Îl, Comm. p. 71. — *Leucanthemum Gmelini* LEDEB., Fl. Ross. II p. 541; MAEKAWA in Transact. Sapporo Nat. Hist. Soc. VIII (1921) p. 7.

Northern Kuriles: Paramushir TAKEO acc. to MAEKAWA loc. cit., KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit., do. ISHIKAWA acc. to MAEKAWA loc. cit.

South Kamtchatka: Cape Lopatka collected by Kosacks 1909, do. east coast June 17th 1920 HN No. 10, do. west coast June 19th 1920 HN No. 59, do. June 24th 1920 HN No. 126; »Oxernoi» (= Ozernaja) YOKOYAMA acc. to MAEKAWA loc. cit.; N. of the mouth of Ozernaja R. noted by HN; Javina RUBINSKI 1909, do. noted by HN; S. of lower Kochegochek R. noted by HN; Golygina village Aug. 8th 1921 HN No. 2749; N. of the mouth of Golygina R. noted by HN; »Opara» (= Opala) IGARI acc. to MAEKAWA loc. cit.; N. of Opala village noted by HN; near the mouth of Bolshaja R. KOMAROV 1908 (Hb. Holm.), do. noted by HN; Bogatyrjovka July 16th 1920 HN No. 442 and 442 a; Toporkoff Island, Sarannaja Bay Aug. 8th 1920 HN No. 707; the delta of Avatcha R. RAMENSKI 1908; »Avatcha Bay» acc. to HOOK. & ARNOTT loc. cit.

East Kamtchatka: The »tundra» at Majak PERFILJEF 1910 (Hb. Berol.); Petropavlovsk STEWART, do. KOMAROV 1908, do. July 8th 1928 W. EYERDAM; Kalashtyrka RUBINSKI 1908; the mouth of Jurtochnaja R. KOMAROV 1909.

Commander Islands: Bering Island STELLER acc. to GMEL. loc. cit., VOSSNESENSKY 1844, KJELLMAN, DYBOVSKY, GREBNITZKY, acc. to FEDTSCH. loc. cit. STEJNEGER, acc. to MAEKAWA loc. cit. YOKOYAMA, PROTOPOPÓF 1909; Copper Island DOBROTVORSKY and acc. to FEDTSCH. loc. cit. STEJNEGER, DYBOVSKY, TILMAN and MOROZEWICZ.

West and North Kamtchatka: Between Bolsheredsk and Utka Rubinski 1908; Krutugorovaja Rubinski 1908, do. Bezais 1909; Tigil Levitzky, the mouth of Tigil R. Bezais 1909; Ljesnaja R. Bjeloussof 1914; Karaga



Fig. 3. Leaves of a—i *Chrysanthemum arcticum* from Kamtchatka (a, b, c, d Hn No. 2749; e, f Hn No. 59; g »*Kamtschatka* Eschscholtz», type-specimen of *Leucanthemum Gmelini* Ledeb.; h, i Hn No. 707; k, l *Chrysanthemum Yezoense* from Hakodate (leg. Malaise); m, n *Chrysanthemum arcticum* from Waigatch (leg. Ekstam); o *Chrysanthemum Weyrichii* from Saghalin (leg. Glehn 1861); p, r *Chrysanthemum arcticum* from Jokenga Kola penins. (leg. Hultén). All natural size.

acc. to Barrett-Hamilton loc. cit.; Karaginsk Island Mertens, do. Postels, do. Loginovski 1910.

»Kamtchatka»: Krascheninnikof acc. to Gmel. loc. cit., Eschscholtz (sub *Leucanthemum Gmelini* Herb. Ledeb.), Lubarsky, Rastargujeff, Kastalsky, Kusmischeff, Mertens, Peters 1831, Bogdanowitsch.

In South Kamtchatka *C. arcticum* occurs here and there along the coast, sometimes also somewhat inland. It flowers from the beginning of July to the end of August.

Our plant is fairly variable and several undoubtedly hereditary forms occur. It seems impossible, however, to draw any line of demarcation between those forms, as intermediate forms often occur. One extreme is the high-grown branched plant with pinnatifid leaves and narrow dark-brown margin on the involucral scales, which Ledebour described as a separate species *Leucanthemum Gmelini* (cf. fig. 3, g). As Linnaeus, when describing his *L. arcticum*, mentions Kamtchatka as the home of the plant and gives Gmelin's »*Pyrethrum foliis longe petiolatis palmatis supra dilatatis ultimis laciniis trilobis* ... t. 84» as a synonym, in the first place he apparently had in view this very plant, which was later named *C. Gmelini* by Ledebour. The arctic European plant, which was unknown to Linnaeus, differs considerably from the Pacific and might be taken as a separate subspecies. It has more cuneate and narrow radical leaves (cf. fig. 3), stem and leaves glabrous except under the involucrum, thinner involucral scales with, on an average, broader and more split-up scarious margin, the ligulae of the ray-flowers having few, usually 4—5 veins, while the Pacific plant is more hairy and the ligulae of its ray-flowers have 8—10 veins. In order to investigate this question more closely it is desirable to obtain a larger body of material of the N. American plant than I have at my disposal, as it seems that the Hudson Bay plant approaches the European. In Japan and on Saghalin several closely related forms occur, which were dealt with by Maekawa loc. cit., who distinguishes the one from the other chiefly on the strength of the shape of the radical leaves. With the exception of *C. Weyrichii* (cf. fig. 3, o) they may be regarded as varieties or subspecies of *C. arcticum*.

Type of distribution: ?

Geographical area: Europe: Eastern Kola penins., Vaigatch. Asia: in several forms from Chukch Penins. southwards along the coast to Udskoj distr., Saghalin, Ussuri (one locality), Yezo and northern Honshu. America: Islands and shores of the Bering Sea, the coast of the arctic American mainland eastwards to Hudson Bay.

Chrysanthemum Leucanthemum L., Sp. pl. ed. I (1753) p. 888.

East Kamtchatka: Petropavlovsk July 19th 1928 W. Eyerdam; between Petropavlovsk and Savoiko on the path July 9th 1920 Hn No. 380.

This plant occurs occasionally, having been introduced in the neighbourhood of Petropavlovsk.

Chrysanthemum Weyrichii (Maxim.) Miyabe & Miyake, Fl. Saghalin (1915) p. 251.

Maekawa in Transact. Sapporo Not. Hist. Soc. VIII (1921) p. 8. — [*Leucanthemum Weyrichii* Maxim. in Mém. Ac. Imp. Sc. St. Petersb. par. div. sav. IX (1859) p. 156.]

MAEKAWA loc. cit. reports this species from Paramushir (collected by TARO) and from Shumshu (collected by ISHIKAWA). *C. Weyrichii* is a plant that differs a good deal from *C. arcticum* and its nearest allies, and is otherwise known from Saghalin and southern Yezo only. As KUDO does not mention this species from Paramushir in his flora of that island or from the northern Kuriles in his work on the vegetation of Yezo, both of which works are later than MAEKAWA's paper, the report might need confirmation. It is possible that one of the numerous forms of *C. arcticum* was mistaken for *C. Weyrichii*.

733. ***Tanacetum vulgare*** L., Sp. pl. ed. I (1753) p. 844.

var. ***boreale*** (FISCH.) TRAUTV. & MEYER in Florul. Ochotens. phaenogama (1856) p. 54.

»*Tanacetum foliis pinnatis, pinnis pinnatifidis . . .*» GMEL., Fl. Sib. II p. 133 quoad pl. ex Insula Beringii. — *Tanacetum vulgare* GEORGI, Beschreib. III: 5 p. 1231; LEDEB., Fl. Ross. II p. 601 quoad pl. ex Insula Beringii; HERDER, Pl. Radd. Monopet. No. 88 in Bull. Mosc. 38: 1 (1865) p. 417 et RADDE, Reisen III: 2 p. 49. — »*Tanacetum*» MERTENS, Bemerk. Fl. Koragins p. 63. — [*Tanacetum boreale* FISCH. ex DC., Prodr. VI (1837) p. 128]; LEDEB., Fl. Ross. II p. 602; FEDTSCH., Fl. Îl. Comm. p. 74.

South Kamtchatka: The »volcanic desert» at Shadutka noted by HN; upper Savan R. 250 m. Aug. 1st 1921 HN No. 2545; near the hot springs at upper Opala R. noted by HN; Bolsheredsk noted by HN; »Paratun» STUBENDORFF; Starichkoff Island (= Toporkof Island, Sarannaja Bay) PERFILJEF 1911; Nikolajevsk KOMAROV 1908; mt. Palovinaja, Savoiko KOMAROV 1908; Savoiko July 27th 1928 W. EYERDAM; Korjaka KOMAROV 1908.

East Kamtchatka: Petropavlovsk DOBROTVORSKY, do. PERFILJEF 1910, do. Aug. 14th 1920 HN No. 875, do. Aug. 16th 1920 HN No. 881, do. July 21st and 23rd and Aug. 10th 1928 W. EYERDAM; Shivelutch KOZLOVSKY 1910.

Commander Islands: Bering Island STELLER acc. to GMELIN loc. cit. (acc. to FEDTSCH. loc. cit. doubtful).

Central Kamtchatka: Shtchapina KOMAROV 1909; Klutchi BEZAIS 1908 Hb. Berol.

West and North Kamtchatka: Tigil GUDZENKO 1910; Uka Herb. Sapporo; Ljesnaja bay BJELOUSSOF 1914; Karaginsk Island MERTENS, do. LOGINOVSKI 1910.

»Kamtchatka»: MERK (Hb. PALLAS), LANGSDORFF, ESCHSCHOLTZ, LUBARSKY, STEWART, KASTALSKY (Hb. Berol.), MERTENS and acc. to HERDER loc. cit. LEVITZKY.

In South Kamtchatka this plant is rare. Var. *boreale* differs from the head-form chiefly in its more dissected leaves with their narrow, sharp-serrulated segments. All forms connecting var. *boreale* with the head-form seem however to exist. I was not able to notice any constant difference in the pappus. Var. *boreale* occurs throughout Siberia, but is more common east-

wards. Kamtchatka specimens are often comparatively hairy, those from the northern part of our area have less dissected leaves and come nearer the head-form.

Type of distribution: Eurasiatic.

Geographical area: The entire species: Europe: from northern Scandinavia, Kolgujef and Samoyede Land, southwards to northern Spain, Italy and Caucasus. Asia: at Yenisei from about 70° N. lat., from lower Lena R. and Chukch Penins., southwards to Asia Minor, Semiretchensk prov., northern Mongolia, northern Corea and Yezo. Introduced into N. America.

Artemisia Absinthium L.

LEDEB., Fl. Ross. II p. 598.

LEDEBOUR's record reads: ». . . insula Beringii? (STELLER)». It was possibly caused by STELLER's report of »*Absinthium arborescens*» in his manuscript on the flora of Bering Island. STELLER undoubtedly meant some other *Artemisia*-species.

The species should be excluded from the flora of our area.

734. ***Artemisia arctica*** LESSING in Linnaea VI (1831) p. 213.

DC., Prodr. VI p. 119; LEDEB., Fl. Ross. II p. 591; HERDER, Pl. Radd. Monopet. No. 121 in Bull. Mosc. 40: 1 (1867) p. 231 et RADDE, Reisen III: 2 p. 83 (α *norvegica* quoad pl. Kamtsch., γ *Kamtschatica*); FEDTSCH., Fl. Îl. Comm. p. 73 excl. syn. *A. Richardsoniana*. — *Artemisia Chamissoniana* BESSER in Nouv. Mém. Soc. Nat. Mosc. III (1834) p. 78 (γ *unalaschcensis*, δ *Petropauliana*, ε *Karaginskiana*, ζ *Kamtschatica*). — *Artemisia norvegica* BESSER in Nouv. Mem. Soc. Nat. Mosc. III (1834) p. 77; MAXIM. in Mél. Biol. VIII (1872) p. 533; ASA GRAY, Syn. Fl. N. Amer. 1: 2 p. 371 (var. *pacifica*); YABE & YENDO, Fl. Shimushu p. (196) (var. *pacifica*); KUDO, Fl. Paramush. p. 168 (f. *longepedunculata*, f. *arctica*); KOM. in Herb.

Northern Kuriles: Paramushir KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: ». . . und in der Nähe der Lopatka» acc. to HERDER loc. cit.; S. of the mouth of Kambolnoje R. RUBINSKI 1909; the mouth of Kambolnaja R. RUBINSKI 1909; Kurile Lake noted by HN; N.W. of Kurile Lake noted in A. 210, A. 211; N. of Kurile Lake noted in A. 208; Oxernoj (= Ozernaja) Hb. Sapporo; N.W. of Ozernaja noted by HN; N.E. of Javina noted in A. 95; W. of Sholtovskaja volcano noted in A. 205; S. of lower Kochegochek R. noted by HN; Kochegochek noted by HN; Sahach noted in heath and in A. 191; between Kochegochek and Golygina noted in A. 102; the junction of Golygina and Ksudach rivers noted by HN; mt. »Dogshinag» Golygina R. RUBINSKI 1909; S. of Golygina noted by HN; Golygina village noted by HN; between the mouths of Golygina and Opala rivers in heath noted by HN; the western Shadutka R. noted in meadows by HN; N. of Opala village noted in A. 214; the »volcanic desert» at Shadutka noted by HN; Shadutka volcano 1125 m. Aug. 2nd 1921 HN No. 2580; Lake Sterbot noted by HN; the divide between Savan and Shadutka R. noted in A. 80; N.W. slope

of Assatcha mts. noted in A. 177; upper Udoshk R. noted in A. 78 b; Akhomten Bay Aug. 30th 1920 Hn No. 1177 (Malaise), do. 450 m. Sept. 9th 1920 Hn No. 1296, do. 250 m. Sept. 11th 1920 Hn No. 1305, do. 550 m. noted by Hn, do. noted in A. 26, A. 31, A. 36 a, A. 36 b, A. 37 a, A. 37 b, A. 38; Mutnovskaja volcano 800 m. July 28th 1922 Hn No. 4045; Gorelaja volcano noted in A. 162, A. 167, A. 171, A. 173, the first flower for the season noted on July 22nd 1922; Opala volcano 1040 m. July 21st 1921 Hn No. 2304, do. noted in A. 71, A. 72, A. 73, A. 77, A. 78 a; lower Tolmachovaja R. noted by Hn; the Kohelok Pass 660 m. noted in A. 125; upper (Paratunka-) Bystraja R. noted in A. 128; mt. Trubi, Vilju R. Komarov 1908; mt. Saraj, Shalsan valley Komarov 1908; Shalsan R. 350 m. noted by Hn; Uzdets R. Komarov 1908; Natchika Stewart; mt. Zerkalo, Natchika noted in A. 117, A. 118, A. 119 and in alpine meadow; mt. Palovinaja, Savoiko 700—800 m. July 8th 1920 Hn No. 326 b, do. on the top Aug. 1st 1928 W. Eyerdam; Poperochnaja R. Komarov 1908.

East Kamtchatka: Between Petropavlovsk and Avatcha volcano noted in A. 16; Avatcha volcano 675 m. July 30th 1920 Hn No. 623; »auf dem Vorgebirge zu Schipun» (= Cape Shipunski) acc. to Herder loc. cit.; the Semjatchik valley Komarov 1909; Kichipinitch volcano Komarov 1909; mt. Krasheninnikof Komarov 1909 (Hb. Berol.); Uzon Komarov 1909 (Hb. Berol.); Lake Kronoki 900 m. Sept. 12th 1921 Hn No. 3596 (Malaise); the Kronoki Pass Komarov 1909; Klutchevskaja volcano Bezais 1908; Ustj-Kamtchatsk July 30th 1925 Malaise No. 551.

Commander Islands: Bering Island Kjellman, Grebnitzky 1894, Morozewicz acc. to Fedtsch. loc. cit.; Copper Island Morozewicz acc. to Fedtsch. loc. cit., Sandberg Aug. 26th 1921 (Hb. Holm.).

Central Kamtchatka: Klutchovka R., Malka July 29th 1924 P. T. Novograblenof; the Ganala »tundra» Komarov 1909; sources of Kashkan R. Komarov 1909 (Hb. Berol.); Kunchekla Komarov 1909; Anauna R. Sept. 5th 1926 Malaise No. 342, do. Aug. 19th 1926 Malaise No. 340.

West and North Kamtchatka: between Sedanka and Jelovka Bezais 1909; Karaginsk Island Mertens, do. Loginovski 1910.

»Kamtchatka»: Steller acc. to Ledeb. loc. cit. »*Artemisia montana* d. S. p. Kamtsch. in excelsis mont. Pallas» (Hb. Berol., probably the specimen of Steller named by de Schlechtendal pater); Langsdorff, Eschscholtz and Kastalsky acc. to Herder loc. cit.; Stewart, Kusmischeff, Mertens, Rieder 1831.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 78 b, A. 119); Scattered (A. 191).

In *Vaccinium—Empetrum*—Moss. ass.:
Single (A. 16, A. 95, A. 214).

In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Sparse (A. 77); Scattered (A. 78 a, A. 211); Abundant (A. 118, A. 210); Profuse (A. 125).

In *Artemisia arctica—Solidago—Salix »acctica»* ass.:
Single (A. 31); Sparse (A. 38, A. 205); Scattered (A. 37 a, A. 37 b, A. 71, A. 80, A. 128, A. 177, A. 208); Abundant (A. 26, A. 73).

In *Artemisia arctica—Rhododendron kamtschaticum—Salix »arctica»* ass.:
Single (A. 36 a, A. 36 b, A. 72, A. 171).

In *Vaccinium—Empetrum—Rhododendron chrysanthum* ass.:
Single (A. 162, A. 167, A. 173); Scattered (A. 127).

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 102).

A. arctica is common in the alpine region of South Kamtchatka. It is characteristic of the alpine meadows, in which it is invariably present, but it also occurs (although not so frequently) in the elevated lowland meadows and on the heaths. It flowers from the end of July to the beginning of September.

A. arctica has often been associated with the European *A. norvegica* Fr., even in recent taxonomic literature, although already Kjellman writes that »no Scandinavian botanist should venture to consider *A. arctica* identical with our *A. norvegica*» (translated from Vega-Exp. Vetensk. Iakttag. I, 1882 Swedish edition p. 500). *A. arctica* differs from *A. norvegica*, with which it is certainly closely related, in the following respects. *A. arctica* is a comparatively high-grown plant usually 30—60 cm. high; it is only in arctic situations or towards its altitudinal limit that it becomes more low-grown. The radical leaves are long-petiolated, pinnate (never palmatifid), usually with 3—4 pairs of pinnae, which taper to a short petiole (cf. fig. 4 a—g). The ultimate sections of the leaves are long-acuminated and often serrulated. The stem-leaves are numerous, the lower having 3—4 pairs of pinnae. Leaves and stems are floccose when young, but become glabrous in time, except for the upper part of the stem and the peduncles. *A. norvegica* is usually more low-grown (10—25 cm.). The radical leaves are more short-petiolated, more or less clearly palmatifid, usually with 5 principal lobes which are irregularly lobed, linear and not tapering to a petiole (cf. fig. 4 h—r). The ultimate sections of the leaves are linear, not toothed and more abruptly pointed. The stem-leaves are few, the lower 3—5-lobed. Leaves and stems are covered (often comparatively densely) with hairs. As the above characteristics are so constant that there is never any difficulty in recognizing the respective plants at first sight, and as *A. arctica* occupies a geographical area of its own of a type that it has in common with several other plants, there is absolutely no reason to unite them into one species. The plant from the northern Urals clearly belongs to *A. norvegica*, although the occurrence of glabrous forms there seems to be more common. Acc. to Nordhagen (in litt.), however, glabrous forms also occur in

Norway. The plant from Chorlofka on the N. coast of Kola penins. reported as *A. arctica* by REGEL, and cited by HJELT in Acta Soc. Fauna et Flora Fenn. 54: 1 p. 80, as *A. norvegica*, must be regarded as doubtful as no specimens of it could be found in Russian herbaria. As specimens of *A. borealis*, however, according to information given by A. TOLMATCHEV, are found in the herbarium collected by POHLE and REGEL at Charlovka, the possibility of a



Fig. 4. Leaves of: a—g *Artemisia arctica* from Kamtchatka (a, b lower leaves, c, d bracts of HN No. 326; e HN No. 4045; f, g HN No. 1196); h—r *Artemisia norvegica* (h—o from Dovre in Norway; p, r from the polar Urals). All half natural size.

confusion of names must be taken into consideration and the report must be regarded as in need of confirmation. This easily happens as *A. borealis* was called *A. arctica* by BESSER.

NORDHAGEN discusses the habitat and distribution of *A. norvegica* and its allies in Norsk Geogr. Tidsskr. II (1929) pp. 281—356.

Concerning the treatment of this plant in HALL and CLEMENTS, Phylogenet. Meth. Taxonom. see under *A. glomerata*.

Type of distribution: Eastern Asiatic—Western American.

Geographical area: Asia: From Olenek R. eastwards to Chukch Penins.,

southwards to the sources of Bureja R., Saghalin, and the mts. of Yezo and Honshu. America: from Alaska and Yukon, southwards to Washington. In the Rocky Mts. from Alberta to Colorado and Sierra Nevada; in California the very closely allied *A. saxicola* RYDB. which should possibly be united with our species. In Europe (Central Norway and the northern Urals) the related but clearly distinct *A. norvegica* FR.

Artemisia Besseriana LEDEB., Fl. Ross. II p. 590.

Artemisia chinensis BESSER in Bull. Ac. Imp. Sc. St. Petersb. VIII (1841) p. 303; DC., Prodr. VI p. 118. — *Artemisia lagocephala α triloba* HERDER, Pl. Radd. Monopet. No. 118 in Bull. Mosc. 40: 1 (1867) p. 229 et RADDE, Reisen III: 2 p. 81.

BESSER reports this plant as having been collected by REDOWSKY in Kamtchatka. As REDOWSKY never visited our area his specimens must have been collected elsewhere. REDOWSKY's specimen is preserved in Hb. Berol. LEDEBOUR's collector was TILESIUS. As his plants are not always correctly labelled, the report in question is also probably unreliable, and the plant should be excluded from the flora of our area.

Artemisia biennis WILLD.

BESSER in Nouv. Mém. Soc. Nat. Mosc. III (1834) p. 83; DC., Prodr. VI p. 120; LEDEB., Fl. Ross. II p. 593; HERDER, Pl. Radd. Monopet. No. 123 in Bull. Mosc. 40: 1 (1867) p. 234 et RADDE, Reisen III: 2 p. 86; RYDBERG in N. Amer. Fl. 34: 3 p. 259; HALL & CLEMENTS, Phylogen. Meth. Taxonom. p. 101.

BESSER reports this plant from Kamtchatka as it grew up from seeds which he thought emanated from that country. Other authors only quote BESSER. Even HERDER doubted the correctness of the report. The species should be excluded from the flora of our area.

735. ***Artemisia borealis*** PALLAS, Reise III (1776) App. p. 755 tab. Hh fig. 1.

BESSER, Dracunculi p. 78 et in Bull. Soc. Imp. Nat. Mosc. VIII (1835) p. 80 (δ *Ledebouri*, ζ *Mertensii*); DC., Prodr. VI p. 98 (δ *Ledebouri*, ζ *Mertensii*); HOOK. & ARNOTT in Beechy's Voy. p. 115; LEDEB., Fl. Ross. II p. 567 (δ *Ledebourii*, ζ *Mertensii*); HERDER, Pl. Radd. Monopet. No. 101 in Bull. Mosc. 40: 1 (1867) p. 209 et RADDE, Reisen III: 2 p. 61 (δ *Ledebourii*, ζ *Mertensii*); MAXIM. in Mél. Biol. VIII p. 524 (ζ *Mertensii*); KJELLMAN, Kommandorsk. Faner. Fl. p. 291 (f. *Mertensii*); FEDTSCH., Fl. Îl. Comm. p. 72. — *Artemisia violacea* LEDEB. in Mém. Ac. Imp. Sc. St. Petersb. V (1815) p. 567. — *Artemisia campestris spithamaea* HALL & CLEMENTS, Phylogen. Meth. Taxonom. p. 233 quoad pl. Kamtsch. — *Artemisia arctica* KOM., Voy. Kamtch. p. 454 non LESS.

South Kamtchatka: Between Lake Natchika and (Paratunka-)Bystraja R. KOMAROV 1908; Lake Natchika KOMAROV 1908.

East Kamtchatka: The entrance of Avatcha Bay PERFILJEF 1911; Petropavlovsk STEWART, do. MERTENS, do. WRIGHT 1853—56 acc. to HALL & CLEMENTS loc. cit., do. KOMAROV 1908, do. GUDZENKO 1909, do. July 19th 1920 HN No. 502, do. July 21st 1920 HN No. 556, do. July 22nd 1928 W.

Eyerdam; Kalashtyrka Komarov 1909; Avatcha volcano 675 m. July 30th 1920 Hn No. 599 and 604, do. mt. Saraj 1300 m. noted by Hn; the mouth of Vahil R. Komarov 1909; Uzon Komarov 1909; N.E. slope of Klutchevskaja volcano July 21st 1927 P. T. Novograblenof; Ploskaja volcano, »pervaja ha dolu sopotchka» Protopopof 1909; Ustj-Kamtchatsk July 30th 1925 Malaise No. 553.

Commander Islands: Copper Island Dybovsky acc. to Kjellman loc. cit.

Central Kamtchatka: Gremushej R. Komarov 1908; Korjatskaja volcano Aug. 13th 1928 W. Eyerdam; mt. Aak Komarov 1908; sources of Kamtchatka R. Komarov 1909; Kamtchatka Vershina Komarov 1909; Kashkan R., Pushtchina Komarov 1909; Tolbatchik Komarov 1909; upper Kosyrevsk R. (Bystraja) April 5th 1925 Malaise No. 552; Klutchi Bezais 1909.

West and North Kamtchatka: Tigil Bezais 1909; Karaginsk Island Mertens.

»Kamtchatka»: »*Artemisia camtschatica* (d. S.p.) Kamtschatka in rupibus Pallas» (Hb. Berol.), Merk and Langsdorff acc. to Herder loc. cit., »*Artemisia violacea* mihi Camtschatca . . . dt. am. Tilesius Petrop. 13», Eschscholtz (sub *A. gelida* Ledeb.), Choris, Kastalsky, Mertens.

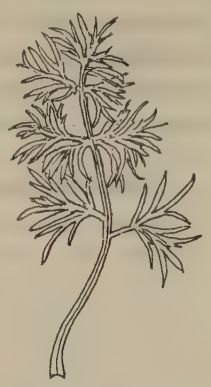


Fig. 5. Basal leaf of *Artemisia borealis* (Hn No. 604). Natural size.

This plant occurs only in the N.E. corner of South Kamtchatka. On Mt. Signalsky in the harbour of Petropavlovsk and on the Avatchinskaja volcano it is common and ascends towards the alpine limit of vegetation. It flowers in July and August.

A. borealis is considered by most authors to be a very polymorphous species. Although a certain variation in the dissection of the leaves can be proved, almost all Kamtchatka specimens together form a fairly distinct type characterized by narrow linear leaf-sections (fig. 5), adpressed silky pubescence and comparatively small heads with more or less pink flowers. They differ in these respects from the majority of the specimens from the shore of the Arctic Ocean (which more closely resemble the primitive figure given by Pallas loc. cit.), and especially from the European, which have broader, often lanceolate leaf-sections (less dissected leaves), looser woolly pubescence and much larger heads. It seems clear that a pronounced genetical difference exists between these two types. Only one of the Kamtchatka specimens, viz. that from Karaginsk Island, belongs to the arctic type. On the other hand, I have seen specimens in close agreement with the Kamtchatka type from Chukch Penins. and the lower Lena R., where both types seem to occur side by side. Hn No. 599 is a peculiar type. It probably originates from a plant that has been covered over by flowing gravel.

As I have seen too little American and Central Asiatic material representing our species it would be of little value to try to differentiate between the various forms, and I therefore take the species in the wide sense, as most

authors do, and refer our plant to var. *Ledebourii* and var. *Mertensii*, which differ chiefly in the degree of the dissection of the leaves.

Type of distribution: Circumpolar, arctic—alpine.

Geographical area: Europe: One locality (Charlovka) on Kola penins. acc. to TOLMATCHEV in litt. (Comp. TOLMATCHEV in Trav. Mus. Bot. Ac. Sc. U.R.S.S. XIX p. 152), Vaigatch and Nova Zembla. A separate form *A. bottnica* LUNDSTR. in the northern part of the Baltic sea was associated by LINDBERG with *A. borealis* (Comp. Acta Soc. Fauna et Fl. Fennica 54. No. 1 p. 75); also *A. nana* GAUD. from the Alps is sometimes referred to *A. borealis*. Asia: along the Arctic Coast to Chukch Penins., southwards in the mts. to Tarbagatai, Central and Eastern Altai, Sajan mts., southern Irkutsk Prov., Vitim-Olekma distr., Jakutsk distr., Ajan, Ussuri (De Castri Bay) and Kamtchatka (except southernmost part). America: along the Arctic Coast to Labrador, Newfoundland and Gaspé Penins. and in the southern part of the Arctic Archipelago; in the mts. southwards to Washington and Colorado (39° N. lat.) W. Greenland between about 64° N. lat. and 72° 30′ N. lat. A map of the distribution is given by FERNALD in Mém. Gray. Herb. II (1925) p. 339.

Artemisia campestris L.

BESSER, Dracunculi pp. 38, 44 et in Bull. Mosc. VII (1835) pp. 40, 46; cfr. MAXIM. in Mél. Biol. VIII p. 524.

Acc. to BESSER this species grew up from seeds which he had obtained from FISCHER and which were supposed to have originated from Kamtchatka. It was thus recorded as coming from Kamtchatka on the same grounds as *A. biennis*. The species should be excluded from the flora of our area.

Artemisia commutata BESS.

BESSER, Dracunculi p. 68 et in Bull. Mosc. VIII (1835) p. 70 (ε *Turtschaninoviana*, ι *Pallasiana*); DC., Prodr. VI p. 98.

This, like several other species, was raised from seed presented by FISCHER and which were supposed to have originated from Kamtchatka. The species should be excluded from the flora of our area.

Artemisia globularia CHAM. ex. BESSER in Nouv. Mém. Soc. Nat. Mosc. III (1834) p. 64.

In Hb. Akad. Petrop. there is preserved a specimen of this species labelled »Kamtchatka CHORIS». The species, which occurs on the shores and islands of the Bering Sea, is otherwise not known from our area.

736. ***Artemisia glomerata*** LEDEB. in Mém. Acad. Sc. St. Petersb. V (1805) p. 564.

BESSER in Nouv. Mém. Soc. Nat. Mosc. III (1834) p. 63; LEDEB., Fl. Ross. II p. 588; HERDER, Pl. Radd. Monopet. No. 114 in Bull. Mosc. 40: 1 (1867) p. 227 et RADDE, Reisen III: 2 p. 79; MAXIM. in Mél. Biol. VIII (1872) p. 532 (excl. syn. *A. senjavinensis*?); KUDO, Fl. Paramush. p. 170. — *Artemisia leontopodioides*

FISCH. ex BESSER in Nouv. Mém. Soc. Nat. Mosc. III (1834) p. 63; LEDEB., Fl. Ross. II p. 587; KOM., Voy. Kamtch. p. 344; *Artemisia curilensis* SPRENG., BESSER in Nouv. Mém. Soc. Nat. Mosc. III (1834) p. 67; DC., Prodr. VI p. 117. — *Artemisia norvegica* subsp. *glomerata* (LEDEB.) HALL & CLEMENTS, Phylogen. Meth. Taxonom. p. 60 (*sic!*).

Northern Kuriles: Paramushir KUDO 1920.

South Kamtchatka: Lopatka RIEDER 1831 (sub »*A. repens*»); N.W. of Kurile Lake 1050 m. noted by HN; Shadutka volcano 1125 m. Aug. 2nd 1921 HN No. 2577, do. 1260 m. noted by HN; Topik volcano 580 m. July 28th 1921 HN No. 2494; Opala volcano 1040 m. July 21st 1921 HN No. 2350; Lake Tolmachovaja 600 m. July 13th 1922 HN No. 3928; Natchika DYBOVSKY 1879, sources of Poperochnaja R. SAVITCH 1908.

East Kamtchatka: Avatcha volcano PERFILJEF 1911 (Hb. Berol.), do. 675 m. July 30th 1920 HN No. 618, do. 1300 m. noted by HN; Kichpinitch volcano KOMAROV 1909; mt. Krascheninnikof KOMAROV 1909 (Hb. Berol.); Lake Kronoki KOMAROV 1909; the Kronoki Pass KOMAROV 1909; Klutchevskaja volcano N.E. slope AFANASEJEV 1909; Klutchevskaja volcano 3500 feet BEZAIS 1909, do. Aug. 5th 1927 MALAISE (dwarf form from high altitude), do. Aug. 6th 1927 MALAISE; Ustj-Kamtchatsk July 1925 MALAISE No. 550.

Central Kamtchatka: The foot of Korjatskaja volcano KOMAROV 1908; Korjatskaja volcano Aug. 14th 1928 W. EYERDAM; mt. Aak KOMAROV 1908 (Hb. Berol.); Kamtchatka vershina KOMAROV 1909; sources of Kashkan R., Pushtchina KOMAROV 1909; Kunchekla PROTOPOPOF 1909; Anauna R. Aug. 19th 1926 MALAISE No. 338, do. Sept. 5th 1926 MALAISE No. 344.

West and North Kamtchatka: The mouth of Itcha R. BJELOUSSOF 1914; »Zwischen Sedanka und Jelovka, Westl. Gebirgezug Kamtschatkas Ad. ERMAN» (Hb. Berol. sub *Artemisia leontopodioides* FISCH.? and *A. curilensis* SPR.) (without flowers).

»Kamtchatka»: ESCHSCHOLTZ (sub *A. leontopodioides* scripsit LEDEB.) (part of the specimens mixed with *A. trifurcata*), CHORIS acc. to BESSER loc. cit., KUSMISCHEFF acc. to HERDER loc. cit., »*Art. corymbosa* n. sp. Kamtschatca et insulae Curil (PALLAS)», »*A. leontopodioides* FISCH. *A. curilensis* SPR. (Hb. Berol.), PETERS 1832, RIEDER (sub *A. leontopodioides*).

In South Kamtchatka this plant is comparatively rare. I noted it wherever I came across it. It belongs to the alpine region and ascends to the alpine limit of vegetation.

A. glomerata varies somewhat in size, in the density of its hairiness and the length of the peduncles. Usually the heads are short-pedunculated and gathered into globoid clusters, but sometimes part or all of them are long-pedunculated (var. *pedunculosa* KOIDZ. in Bot. Mag. Tokyo, 32 (1918) p. 58).

Such forms are those from Lake Kronoki collected by KOMAROV and HN No. 2494. The achenes are usually glabrous, but in some of the specimens

(for instance Hn No. 2494 and Malaise No. 550) they are hairy on the top and should thus be referred to *A. leontopodioides*, which differs from *A. glomerata* chiefly in that characteristic. As already pointed out by Maxim. loc. cit, this characteristic seems, however, to be of minor taxonomical value.

Our species was, oddly enough, associated with *A. norvegica* by Hall and Clements loc. cit. As far as I can see, there is nothing to show that the two plants are at all closely related. They are as different as can be expected of two species belonging to the same genus, not only in habitus but also in the details and geographical area. The utmost variations of the respective types do not even converge, much less meet. Apart from the immense difference in habitus, a single glance at the widely differing subterraneous parts of the two plants, for instance, affords convincing proof that *A. glomerata* is very different not only from *A. norvegica* and *A. arctica* but also from *A. trifurcata* (which under the name of *A. norvegica heterophylla* was also referred to *A. norvegica* by Hall and Clements). Similar methods consistently applied would result in very many genera which now include several species being regarded as monotypical. It might be of interest to note that a plant that is very similar to *A. glomerata* in its habitus occurs in the Alps, viz. *A. glacialis*, which, however, owing to its pilose receptacle is referred to another section of the genus.

Type of distribution: Asiatic Pacific.

Geographical area: Asia: from Chukch Penins. southwards to Ochotsk (*A. corymbosa* Fisch. leg. Kruhse!), Kamtchatka, the Kuriles and Yezo (one locality acc. to Koidz. loc. cit., not reported in Kudo 1925). Also reported from Honshu (Mt. Komagatake). America: W. Alaska (Kotzebue Sound, Port Clarence, Cape Thompson).

Artemisia Koelreuteriana Bess.

Besser in Mém. Ac. Imp. Sc. St. Petersb par div. sav. IV (1845) p. 454.

The home of this plant was unknown to Besser, but he supposed that it was Sibiria orientalis or Kamtchatka. The species does not belong to the flora of our area.

Artemisia sachalinensis Besser, Dracunculi p. 46 et in Bull. Soc. Nat. Mosc. VIII (1835) p. 48.

DC., Prodr. VI p. 96; Ledeb., Fl. Ross. II p. 562; Herder, Pl. Radd. Monopet. No. 95 in Bull. Mosc. 40: 1 (1867) p. 202 et Radde, Reisen III: 2 p. 54. — *Artemisia capillaris* Maxim., Mél. Biol. VIII (1872) p. 524.

All the above-cited reports of this plant from Kamtchatka are based on a specimen in Hb. Stev. collected by Tilesius. As Tilesius' plants are not always reliably labelled, this report is probably erroneous, and the plant should be excluded from the flora of our area.

Artemisia samamisica Besser, Aborot. in Nouv. Mém. Soc. Nat. Mosc. III (1834) p. 50 (*Samamisica*).

DC., Prodr. VI p. 112; Ledeb., Fl. Ross. II p. 584; Herder, Pl. Radd. Monopet. No. 111 in Bull. Mosc. 40: 1 (1867) p. 221 et Radde, Reisen III: 2 p. 73. — *Artemisia vulgaris* var. *samamisica* Maxim. in Mél. Biol. VIII p. 536; Miyabe & Miyake, Fl. Saghalin p. 258.

This plant was reported by Besser from »alpibus Samamisicis» (S. of the Caspian Sea) and from Kamtchatka (collected by Lubarsky). The plant was unknown to Ledebour and it is unknown to me. Maximowicz only mentions it among the varieties of *A. vulgaris*, but Miyabe & Miyake refers a plant from the shores of Saghalin to this type, adding that it is possibly only a form of *A. vulgaris* var. *latiloba* Ledeb. When I visited Hb. Akad. Petrop. I could not find the plant there but since then Mr. A. Tolmachev has kindly furnished me with a drawing of a leaf of one specimen collected at Petropavlovsk by Kastalsky and labelled *A. samamisica*. To judge from the form of that leaf it is an *A. Verlotorum* form.

»**Artemisia santonica**(?)» Mertens, Bemerk. Fl. Koragins. p. 63.

It is not possible to decide which plant Mertens had in mind when he reported this plant from Karaginsk Island.

Artemisia scoparia Waldst. & Kit.

Besser, Dracunculi p. 92 et in Bull. Soc. Nat. Mosc. VIII (1835) p. 94; Ledeb., Fl. Ross, II p. 569; Maxim. in Mél. Biol. VIII (1872) p. 523.

Besser, and other authors after him, report this species from Kamtchatka on the basis of specimens in Herb. Prescott. Probably Kamtchatka Province and not the Peninsula was meant. The species is otherwise not known from our area.

737. ***Artemisia Stelleriana*** Besser in Nouv. Mém. Soc. Nat. Mosc. III (1834) p. 79, pl. 5.

DC., Prodr. VI p. 119; Ledeb., Fl. Ross. II p. 592; Maxim. in Mél. Biol. VIII (1872) p. 534; Herder, Pl. Radd. Monopet. No. 119 in Bull. Mosc. 40: 1 (1867) p. 230 et Radde, Reisen III: 2 p. 82; Yabe & Yendo, Fl. Shimushu p. (196); Kom., Voy. Kamtch. pp. 176, 454; Kudo, Fl. Paramush. p. 169.

Northern Kuriles: Paramushir C. Taro 1892 and S. Yokoyama 1893 acc. to Kudo loc. cit., Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka June 22nd 1920 Hn No. 87; between Ozernaja and Javina Aug. 11th 1921 Hn No. 2798 a; Kochegochek Sept. 9th 1922 Hn No. 4550; the mouth of Opala R. noted by Hn; N. of Opala village noted by Hn; Akhomten Bay Sept. 12th 1920 Hn No. 1348; near the mouth of Bolshaja R. July 5th 1921 Hn No. 2007 (A. 44).

East Kamtchatka: Petropavlovsk Kastalsky (sub »*Artemisia Stelleriana* mihi»); Kalashtyrka acc. to Kom. loc. cit.; between the mouths of Nalutcheva and Kamenuchka rivers Perfiljef 1910; the mouth of Beresovaja R. Komarov 1909; the mouth of Semjatchik R. Komarov 1909 (Hb. Berol.); Ustj-Kamtchatsk Bezais 1908, do. Protopopof 1909, do. July 1925 Malaise No.

554, do. Aug. 12th 1928 W. EYERDAM; »ad margines fl. Kamtchatka VOSSNESENSKY 1846».

West and North Kamtchatka: Tigil BEZAIS 1909.

»Kamtchatka»: MERK, LUBARSKY, STEWART, KASTALSKY, KUSMISCHEFF, PETERS 1831, RIEDER »Kamtschatka auf der Oceanküste *A. curilensis* Spr.» later added by HERDER »*A. chinensis* L. vel *A. Stelleriana* BESS.».

Noted in the following association:

In *Elymus* ass.:

Single (A. 44).

A. Stelleriana is comparatively common on the sandy coasts of Kamtchatka.

The specimens usually have a simple stem, but branched forms also occur. Our plant is strictly confined to the sea-shore and was never observed inland.

Type of distribution: Asiatic Pacific.

Geographical area: From Kamtchatka southwards over the Kuriles to southern Yezo and Saghalin, one locality near the mouth of Amur R. Cultivated and naturalized on the seashores in Southern Sweden and Denmark (compare ARESCHOUG in Bot. Not. 1880 pp. 137—150 and 1883 pp. 111—120 and in Journ. Bot. N. S. 32, 1894, pp. 70—75 and ANDERSSON in Bot. Not. 1882 pp. 197—200), and in eastern N. America from Quebec to New Jersey westwards to Wisconsin (Compare HALL & CLEMENTS Phylogenet. Meth. Taxonom. p. 67).

738. ***Artemisia Tilesii*** LEDEB. in Mém. Ac. Imp. Sc. St. Petersb. V (1812) p. 568.

BESSER in Nouv. Mém. Soc. Nat. Mosc. III (1834) p. 70 (α *Kamtschatica*, ε *Kotzebuensis*). — *Artemisia vulgaris* δ *Tilesii* LEDEB., Fl. Ross. II p. 586; HERDER, Pl. Radd. Monopet. No. 112 in Bull. Mosc. 40: 1 (1867) p. 223 et RADDE, Reisen III: 2 p. 75; ?A. GRAY in Proc. U. S. Nat. Mus. VII (1884) p. 528; ?FEDTSCH., Fl. Îl. Comm. p. 72 pro parte.

East Kamtchatka: The Kronoki Pass KOMAROV 1909 (Hb. Berol.); »Füssen der Kamtschatische Sopke» (= Klutchevskaja volcano) RIEDER 1831; Ustj-Kamtchatsk July 30th 1925 MALAISE No. 556.

Commander Islands: ?Bering Island STEJNEGER (most of the specimens cited by FEDTSCH. loc. cit. as »var. *Tilesii*» belong to *A. Verlotorum*).

Central Kamtchatka: The source of Kamtchatka R. KOMAROV 1909; the hot springs at Pushtchina KOMAROV 1909; Kashkan R. above the hot springs at Pushtchina KOMAROV 1909 (Hb. Berol.); the sources of the right Shtchapina R. KOMAROV 1909 (Hb. Holm.); Anauna R. Sept. 5th 1926 MALAISE No. 341.

West and North Kamtchatka: Tigil LEVITZKY 1848; Karaginsk Island MERTENS.

»Kamtchatka»: *Artemisia Tilesii* mihi Kamtschatka Ledeb., *Artemisia Tilesii α kamtschatica* mihi Besser (Hb. Berol.); Lubarsky acc. to Herder loc. cit.; »Petropavlovsk Mertens».

A. Tilesii apparently has a northern distribution within our area. Its southernmost localities are alpine. Although it occurs in several forms, it is a plant with very characteristic habitus, characteristic leaf-form and inflorescence, and large heads. It has a distinct geographical area, and I can see no reason for associating it with *A. vulgaris*. It is perhaps doubtful whether the type, which acc. to Ledeb. was collected by Tilesius in Kamtchatka, really originates from our area. Compare Hultén. Fl. Kamtch. I p. 6.

Type of distribution: Eurasiatic—Western American.

Geographical area: Europe: Kolgujef, Samoyede Land, Vaigatch and Nova Zembla. Asia: along the Arctic Coast to Chukch Penins., southwards to Vilju distr., Jakutsk distr. and Central Kamtchatka. America: the Aleutian Islands and Alaska eastwards along the Arctic Coast to Hudson Bay southwards to ?.

739. ***Artemisia trifurcata*** Steph. ex Spreng., Syst. Veg. III (1826) p. 488.

Herder, Pl. Radd. Monopet. No. 120 in Bull. Mosc. 40: 1 (1867) p. 230 et Radde, Reisen III: 2 p. 82; Maxim. in Mél. Biol. VIII (1872) p. 533; Fedtsch., Fl. Îl. Comm. p. 73; Kudo, Fl. Paramush. p. 170 (var. *heterophylla*). — *Artemisia heterophylla* Besser in Nouv. Mém. Soc. Nat. Mosc. III (1834) p. 74 (β *Mertensiana*, γ *Kitlitziana*); DC., Prodr. VI p. 118; Ledeb., Fl. Ross. II p. 591. — *Artemisia norvegica heterophylla* Hall & Clements, Phylogenet. Meth. Taxonom. p. 59.

Northern Kuriles: Paramushir Kudo 1920.

South Kamtchatka: Shadutka volcano 1125 m. noted by Hn; Topik 580 m. Aug. 28th 1921 Hn No. 2479; Assatcha mts. 1100 m. Aug. 10th 1922 Hn No. 4186; Mutnovskaja volcano 800 m. July 28th 1922 Hn No. 4040; Gorelaja volcano 800 m. July 23rd 1922 Hn No. 4004, do. noted in A. 164, A. 166, A. 168, A. 170, A. 174, A. 176; Opala volcano 1040 m. July 21st 1921 Hn No. 2329, do. July 23rd 1921 Hn No. 2368, do. 1300 m. noted by Hn; Lake Tolmachovaja July 13th 1922 Hn No. 3927; between Lake Natchika and upper (Paratunka-) Bystraja R. Komarov 1908; Lake Natchika Komarov 1908 (Hb. Berol.); Shalsan Vossnesensky 1847; sources of Poperochnaja R. Komarov 1908.

East Kamtchatka: The Kronoki pass Komarov 1909; the foot of Klutchevskaja volcano Kurtashof 1909 (sub *A. glomerata*).

Commander Islands: Bering Island »Sarauna» (= Saranna) acc. to Hall and Clements loc. cit. p. 64; Copper Island Dybovsky 1879; Dobrotvorsky, Macoun 1891 acc. to Hall and Clements loc. cit., Morozevicz acc. to Fedtsch. loc. cit.

Central Kamtchatka: Gremushej R. Komarov 1908; mt. Aak Komarov

1908; the Ganala mts. July 18th 1924 P. T. Novograblenof; Anauna R. Sept. 5th 1926 Malaise No. 343, do. Aug. 19th 1926 Malaise No. 339.

»Kamtchatka»: Eschscholtz, Rastargujeff, Stewart, Kusmischeff all acc. to Herder loc. cit., Kitlitz acc. to Besser loc. cit., Mertens acc. to Besser loc. cit.; Peters acc. to Herder loc. cit., »Kusatschinbucht» Rieder 1831 (the place is unknown to me), »Petropavlovsk Wright 1853—56».

Noted in the following associations:

In *Vaccinium—Diapensia*—Lichen ass.:
Single (A. 164, A. 166); Sparse (A. 168, A. 170).

In *Artemisia trifurcata—Salix »arctica»—Oxytropis* ass.:
Sparse (A. 176); Abundant (A. 174).

In the high-alpine region of South Kamtchatka *A. trifurcata* is comparatively common on the *Diapensia* heaths and is characteristic of that seed plant-association which reaches the highest altitudes (the *Artemisia trifurcata —Salix »arctica»—Oxytropis* ass.). It flowers from the middle of July to the end of August.

Most of the specimens have their radical leaves twice ternate or quinate and should therefore be referred to var. *heterophylla* (Bess.) Kudo, but specimens with less dissected leaves which well agree with those of typical *A. trifurcata* also occur. It seems impossible to draw any sharp distinction between these types, as all transitional forms seem to exist. The disk-flowers are usually reddish, though in some cases yellow.

Type of distribution: Eastern Asiatic—Western American.

Geographical area: Asia: known from about the mouth of Lena R., Chukch Penins., Sibiria altaica, Transbaikalia, Kamtchatka and the northern Kuriles. America: the north coast of Alaska, southwards in the mts. to Great Slave Lake and Washington (Mt. Rainier).

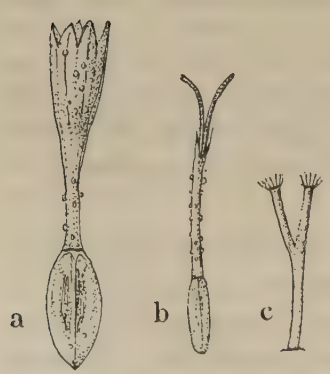


Fig. 6. a disk-flower, b marginal flower, c style of *Artemisia ursorum* (Hn No. 647). Enlarged ten times.

740. ***Artemisia*** (Sect. *Abrotanam* Bess.) ***ursorum*** nov. spec. fig. 6 et Pl. 6 fig. g.

Herba perennis, rhizomate subhorizontali, caule circ. 50 cm. alto, striato, inferne parce, superne densius tomentoso-pubescente. Folia obovato-cuneata, supra sparce arachnoidea, subtus albido-tomentosa, pinnatifida, lobis utraque latere vulgo 2, alte incisis, acuminata, inferiora insuper lobis minoribus utroque latere binis, ternisve ornata, superiora sessilia, inferiora brevipetiolata, summa integra vel subintegra, involucra in racemo inferne folioso axillares, pedunculo 1—2 mm longo, fere hemisphaerica circiter 6 mm longa, squamis 17—20 arachnoideis late subhyalino-marginatis, inferioribus ovato-lanceolatis acutis, interioribus apice obtusissimis et lace-

rata scariosis. Flores radii circ. 8, flores disci circ. 20, 3 mm longi, stylo tubum antherarum haud superante.

East Kamtchatka: Avatcha volcano 675 m. July 30th 1920 Hn No. 677.

This peculiar plant can hardly be regarded as a broad-leaved *A. Verlotorum*, as it has much larger heads with more numerous and very different involucral scales. It further differs from *A. vulgaris* in its long stoloniferous rootstock. Similar specimens may be found among the plants referred to »*A. vulgaris* var. *stolonifera* Maxim.» or »*A. vulgaris* var. *integrifolia* Ledeb.».

Type of distribution: ?

Geographical area: So far only known from the type-locality.

741. ***Artemisia Verlotorum*** Lamotte in Assoc. Franc. Session 5 (Clermont Ferrand) (1876) p. 513.

Hultén in Sv. Bot. Tidskr. 23 1929 p. 496. — »*Artemisia foliis pinnatifidis, planis, laciniatis . . .*» Gmel., Fl. Sib. II p. 108 quoad pl. Kamtsch. — *Artemisia vulgaris* Pennant, Arct. Zool. (1784) p. CXVI; ?Mertens, Bemerk Fl. Koragins. p. 61; Kom., Voy. Kamtch. p. 454; Hultén, Fl. Kamtch. adj. Isl. I pp. 24, 25. — »*Artemisia Tilesii?*» Hook. & Arnott in Beechy's Voy. p. 115. — *Artemisia vulgaris* β *coarctata* Erman, Verzeichn. p. 58. — *Artemisia vulgaris* γ *vulgatissima*, ξ *Kamtschatica* Besser in Mem. Soc. Nat. Mosc. III (1834) p. 51, quoad pl. Kamtsch. — *Artemisia vulgaris* η *Kamtschatica* DC., Prodr. VI p. 113. — *Artemisia vulgaris* ζ *communis* et η *coarctata* Ledeb., Fl. Ross. II pp. 586, 587. — *Artemisia vulgaris* ξ *communis* a *Kamtschatica* Herder, Pl. Radd. Monopet. No. 112 in Bull. Mosc. 40: 1 (1867) p. 224 et Radde, Reisen III: 2 p. 76. — »*Artemisia*» Ditmar, Reisen I pp. 108, 447. — *Artemisia vulgaris* var. *vulgatissima* Yabe & Yendo, Fl. Shimushu p. (195). — *Artemisia vulgaris* var. *Tilesii* Fedtsch., Fl. Îl. Comm. p. 72 saltem pro maxime parte. — *Artemisia vulgaris* var. *kamtschatica* Kudo, Fl. Paramush. p. 168.

Northern Kuriles: Paramushir C. Taro 1892, Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka Gudzenko 1910; Kurile Lake noted in meadow by Hn; lower Ozernaja R. Aug. 12th 1921 Hn No. 2812 (A. 96, A. 100); Ozernaja village noted by Hn; upper Unkanakchek R. noted in A. 196 and A. 197; lower Kuseten R. noted by Hn; Sahach noted in meadow by Hn; the junction of Ksudach and Golygina rivers noted in A. 90; Golygina village noted by Hn; upper Ksudach R. noted in A. 83, A. 84; middle Ksudach R. noted in A. 86; between the mouths of Golygina and Opala rivers noted by Hn; the western Shadutka R. noted by Hn; in the »volcanic desert» at Shadutka in former *Betula* forest noted by Hn; between Lake Sterbot and Lake Kambolnoje noted by Hn; upper Savan R. noted in A. 79; N. and N.W. slope of Assatcha mts. in *Betula* forest noted by Hn; upper Opala R. noted in A. 183, A. 184, A. 185; near the hot springs at upper Opala R. noted in A. 180, A. 182; Akhomten Bay Sept. 8th 1920 Hn No. 1187, do. noted in A. 25; upper Udoshk R. noted in A. 78 b; N.W. of Opala volcano

noted in A. 66, A. 67, A. 68, A. 69; upper Abshen R. noted by Hn; lower Bolshaja R. noted in A. 105, A. 106, A. 107; the junction of Tolmachovaja rivers noted in A. 157; the mouth of Balaganchik R. noted in A. 152, A. 153, A. 154; middle Karymchina R. in meadow noted by Hn; lower Karymchina R. noted in A. 124, A. 151; lower Danilina R. noted in A. 61; Agashka R. in *Betula* forest noted by Hn; W. of the mouth of Ipelka R. noted in A. 57; the hot springs at upper Karymchina R. on hot earth noted by Hn; the Kohelok Pass 660 m. in meadow noted by Hn; between Apatcha and Siku R. noted in A. 150; Bolsheredsk noted by Hn; between Bolsheredsk and Apatcha noted in A. 113; lower Bannaja R. in meadow and *Angelica ursina* meadow noted by Hn; the hot springs at Siku R. noted in A. 122; the hot springs at Bannaja R. 440 m. Sept. 12th 1921 Hn No. 3224; Paratunka Stubendorff 1849; Tarja Bay Perfiljef 1910; the mouth of Paratunka R. Aug. 11th 1920 Hn No. 836; between Hutor and Avatcha Komarov 1908; Natchika Komarov 1908; mt. Zerkalo, Natchika noted in A. 114, A. 115, A. 119; between Natchika and Korjaka acc. to Ditmar loc. cit.; Savoiko Aug. 20th 1928 Malaise, do. Aug. 28th 1928 W. Eyerdam, do. Sept. 1st 1928 W. Eyerdam (the heads infected by an insect); Korjaka Komarov 1908.

East Kamtchatka: Petropavlovsk Gudzenko 1910, Perfiljef 1910 Hb. Holm., do. Aug. 11th 1920 Hn No. 836, do. Aug. 16th 1920 Hn No. 879, do. July 23rd 1928 W. Eyerdam, do. Aug. 25th 1928 W. Eyerdam; Kalasthyrka Perfiljef 1910; between Petropavlovsk and Avatcha volcano 350 m. Aug. 24th 1920 Hn No. 1073, do. noted in A. 7, A. 17, A. 18, A. 42; Avatcha volcano 675 m. July 30th 1920 Hn No. 646, do. Aug. 25th 1928 W. Eyerdam; Kichpinitch volcano Komarov 1909; Nishne Kamtchatsk Protopopof 1909; Ustj-Kamtchatsk July 30th 1925 Malaise No. 555; »Fuss des Schiwelutsch auf Kamtschatka Ad. Erman Ad. v. Ch.» (Hb. Berol. sub *Artemisia vulgaris* ξ *kamtschatica* mihi Besser).

Commander Islands: Bering Island Kjellman, Dybovsky 1879, Grebnitzky 1894.

Central Kamtchatka: Malka acc. to Kom. loc. cit.; Tchuchovka mts., Klutchi Bezais 1908; Kamaki Protopopof 1909.

West and North Kamtchatka: Vorovskaja Rubinsky 1908 (doubtful form); Chairusovaja Novikov 1909; Tigil Levitzky 1848, do. Gudzenko 1910; ?Karaginsk Island acc. to Mertens loc. cit.

»Kamtchatka»: Eschscholtz, Lubarsky acc. to Besser loc. cit. (γ *vulgatissima*), Rastargujeff, Stewart, Kusmischeff acc. to Herder loc. cit., Mertens, Postels, Rieder.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:

Single (A. 69, A. 79, A. 84, A. 105, A. 153); Sparse (A. 78 b, A. 86, A. 107, A. 114, A. 119, A. 185); Scattered (A. 67, A. 68, A. 83, A. 96, A. 100, A. 182, A. 184); Abundant (A. 66).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 61, A. 113, A. 124, A. 151); Sparse (A. 122).
In *Betula platyphylla—Thalictrum—Carex* ass.:
Sparse (A. 152, A. 154); Scattered (A. 157).
In *Betula Ermani—Filipendula—Dryopteris* ass.:
Sparse (A. 115); Scattered (A. 196, A. 197); Abundant (A. 180).
In *Betula Ermani—Filipendula—Equisetum hiemale* ass.:
Single (A. 57, A. 90).
In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 106, A. 150); Sparse (A. 42, A. 183); Scattered (A. 7); Abundant (A. 17, A. 18).
In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Sparse (A. 25).

In South Kamtchatka *A. Verlotorum* is very common in all meadows and *Betula* forests of the lowlands. It is a constant component of the meadows. It rarely ascends up to the lower alpine region. It flowers in August and September.

As already pointed out by the author (HULTÉN loc. cit.), the Kamtchatka-plant hitherto usually taken to be a variety of *A. vulgaris* must be considered to agree so well with that described by LAMOTTE as *A. Verlotorum* that it must be regarded as belonging to that species. In Kamtchatka it is a high-grown meadow-plant (*A. vulgaris* is a ruderate plant and a sea-shore plant) with long subterraneous runners (cf. the figures in HULTÉN loc. cit.), characteristic leaf-form, racemiform simple or branched inflorescence, large heads, shiny involucral scales, reddish flowers with broad tube and few resin-spots.

As is but natural, the species is more variable in Kamtchatka than in Europe, but most of the specimens agree well with each other. HN No. 3150 from the hot gravel at the hot spring »Malenki Klutchik» Bannaja (Sept. 12th 1921) is an aberrant type, which has small 3—5 lobed (or even 3—5 toothed) basal leaves and all leaves tomentose even on the upper surface, especially along the veins. It may be regarded as a variety (var. *tomentosa*) of *A. Verlotorum*. An undeveloped plant collected at Malka in 1909 by KOMAROV also belongs to this variety. LEDEBOUR's report of *A. vulgaris* ε *leucophylla* (collected in Kamtchatka by MERTENS) may have been based on a similar form.

Type of distribution: ?Asiatic Pacific.

Geographical area: Asia: from Kamtchatka and Commander Islands southwards at least to Honshu, probably also on Saghalin and in China. America: Unalashka.[1] Introduced into France, Switzerland, Italy, Algeria and Germany (near Lake Constance) (Cf. HULTÉN loc. cit.).

[1] Specimens from Unalashka collected by MACOUN and VAN DYKE kindly sent to me by Prof. FERNALD must be counted as *A. Verlotorum*, although they represent considerable variations from the average type. Thus, the specimen of MACOUN has more glandular corolla than is usually the case, and the specimen of VAN DYKE has no stipular lobes on the leaves. The stipular lobes are, however, subject to wide variation.

742. ***Petasites frigidus*** (L.) FRIES., Summa Veg. Scand. I (1845) p. 182.

»*Tussilago scapo imbricato, floribus corymbosis . . .*» GMEL., Fl. Sib. II p. 145. — [*Tussilago frigida* L., Sp. pl. ed. I (1753) p. 865.] — »*Tussilago* B. Gm. Sib. II 145. No. 125» PENNANT, Arct. Zool. (1784) p. CXVI. — HERDER, Pl. Radd. Monopet. No. 37 in Bull. Mosc. 38: 1 (1865) p. 377 et RADDE, Reisen III: 2 p. 3 (α *genuina*, β *acutiloba*); FEDTSCH., Fl. Îl. Comm. p. 68.

Commander Islands: Bering Island (STELLER) acc. to GMEL. loc. cit.; Copper Island MOROZEVICZ acc. to FEDTSCH. loc. cit.

West and North Kamtchatka: Tigil LEVITZKY; Pallan LOGINOFF 1927 acc. to MALAISE in litt.

»Kamtchatka»: ESCHSCHOLTZ, BOGDANOWITSCH.

Type of distribution: Eurasiatic, transgressing into W. America.

Geographical area: Europe: From Spitzbergen and Nova Zembla southwards to central Sweden, central Finland, Novgorod, Jaroslav and Perm provinces. Asia: along the Arctic Coast and from the New Siberian Islands to Chukch Penins., southwards to Tomsk prov., northern Mongolia, Transbaikalia, Ajan, northern Kamtchatka and Commander Islands. America: from the north coast of Alaska, Banks Land and Melville Island eastwards to Coronation Gulf, southwards in the mts. to Washington (acc. to PIPER.).

Petasites laevigatus REICHENB.

Tussilago aquatica GEORGI, Beschreib, III: 5 p. 1241.

This report seems to have been due to some misinterpretation or confusion in regard to GMELIN's account of *P. frigidus* from Kamtchatka and Bering Island. The species should be excluded from the flora of our area.

Nardosmia Gmelini DC.

LEDEB., Fl. Ross. II p. 466; HERDER, Pl. Radd. Monopet. No. 35 in Bull. Mosc. 38: 1 (1865) p. 370 et RADDE, Reisen III: 2 p. 2.

LEDEBOUR and HERDER report TILESIUS and MERK respectively as having collected this species in Kamtchatka. In Hb. Hort. Petrop. there is preserved a specimen labelled »In Kamtchatka . . . (illegible) . . . dt. am. TILESIUS Petrop. 13». Probably Kamtchatka Province, not the peninsula, was meant. The plant is not known to occur with certainty within our area, but may be expected in its northern parts.

743. ***Arnica Lessingii*** GREENE in Pittonia VI (1900) p. 167 excl. syn.

ILJIN in Trav. Mus. Bot. Ac. Sc. U.R.S.S. XIX (1926) p. 117. — *Arnica alpina* KOM., Voy Kamtch. p. 414.

East Kamtchatka: Kronoki Pass KOMAROV 1909 (Hb. Berol. sub *A. alpina*); Klutchevskaja volcano Aug. 6th 1927 MALAISE; Shivelutch 2800—3000 feet KOZLOVSKI 1910.

Central Kamtchatka: Anauna R. Sept. 5th 1926 MALAISE No. 337.

Our plant agrees well with GREENE's description and with the description given by RYDBERG in N. Amer. Fl. 34: 4 p. 328 and I therefore follow ILJIN in referring it to that species. It differs from *A. frigida* C. A. MEY., which is identical with RYDBERG's *A. nutans*, in its glabrous achenes, violet anthers, yellowish-brown pappus and in the corolla-lobes of the diskflowers having no scattered white hairs. I have seen specimens from Glacier Bay, Alaska and from Port Clarence (KJELLMAN sub *Arnica alpina;* BLAISDELL 1900) belonging to our species, but no material designated by GREENE himself as *A. Lessingii*. Our plant is illustrated in Pl. 6 fig. e, f.

Type of distribution: Eastern Asiatic—Western American.

Geographical area: Asia: Only known from the northern part of Kamtchatka Penins. America: from Cape Lisburne and Yukon to Alaska Penins. and Lynn-Channel.

744. ***Arnica unalaschcensis*** LESSING in Linnaea VI (1831) p. 238.

FEDTSCH., Fl. Îl. Comm. p. 75 (also f. *scaposa*); FERNALD in Rhodora 11 (1909) p. 141; KUDO, Fl. Paramush. p. 170; ILJIN in Trav. Mus. Bot. Ac. Sc. U.R.S.S. XIX 1926 p. 117; HULTÉN in Sv. Bot. Tidskr. 22 (1928) p. 225. — »*Doronicum foliis caulinis oppositis . . .*» GMEL., Fl. Sib. II p. 153 quoad pl. ex insula Beringii. — *Arnica montana* GEORGI, Beschreib. III: 5 p. 1249 quoad pl. ex insula Beringii. — *Arnica latifolia* KJELLMAN, Komm. Faner. Fl. p. 291; FEDTSCH., Fl. Îl. Comm. p. 75.

Northern Kuriles: Paramushir T. SAKURAI 1920 acc. to KUDO loc. cit., KUDO 1920.

South Kamtchatka: Sources of Kidipalok R. 1000 m. Sept. 3rd 1922 HN No. 4457.

Commander Islands: Bering Island STELLER acc. to GMEL. loc. cit., KJELLMAN (also sub *A. latifolia*), DYBOVSKY 1879; STEJNEGER acc. to FEDTSCH. loc. cit., GREBNITZKY, DOBROTVORSKY, KURTASHOF 1909, GUDZENKO 1910, SANDBERG Aug. 18th 1921 (Hb. Holm.); Copper Island DYBOVSKY 1879 and acc. to FEDTSCH. loc. cit. MOROZEVICZ and TILMAN.

In South Kamtchatka *A. unalaschcensis* was found in a single locality on the slopes of a high mountain crest. In this spot the species was fairly abundant. The specimens collected there were low-grown and belong to f. *scaposa* B. FEDTSCH. (loc. cit.). In habitus they differ considerably from the high-grown forms, but there are hardly any differences in detail. Thus, the very high-grown and broad-leaved specimen collected by KJELLMAN on Bering Island and determined as belonging to *A. latifolia* BONG. closely corresponds to the others in the hairiness of the stem and corolla and in regard to the pappus and the involucrum. The leaves of large specimens are, however, more coarsely toothed than those of small specimens, which sometimes have a practically entire margin.

Type of distribution: Northern Pacific.

Geographical area: Asia: Commander Islands, S. Kamtchatka, the Kuriles, the mts. of Yezo and Honshu.

745. ***Cacalia auriculata*** DC., Prodr. VI (1837) p. 329 (emend.).

Ledeb., Fl. Ross. II p. 626; Herder, Pl. Radd. Monopet. No. 141 in Bull. Mosc. 40: 1 (1867) p. 421 et Radde, Reisen III: 2 p. 108; Fedtsch., Fl. Îl. Comm. p. 75; Kudo, Fl. Paramush. p. 170 (var. *kamtschatica*). — »*Senecio foliis ex deltato trilobis . . .*» Gmel., Fl. Sib. II p. 136 quoad pl. ex insula Beringii sec. Fedtsch. loc. cit. — »*Senecio* Gm. Sib. II 136 No. 118» Pennant Arct. Zool. p. CXVI. — *Cacalia hastata* Ledeb., Fl. Ross. II p. 626 quoad pl. ex insula Beringii sec. Fedtsch. loc. cit. — *Senecio davuricus* Schultz-Bip. in Flora (1845) p. 499; Maxim. in Mél. Biol. IX (1874) p. 296 (β *kamtschaticus*); Miyabe, Fl. Kuril. p. 244 (var. *kamtschaticus*); Yabe & Yendo, Fl. Shimushu p. (197) (var. *kamtschaticus*.). — *Cacalia kamtschatica* Kudo in Journ. Coll. Agricult. Hokkaido Imp. Univ. XII (1923) p. 60.

Northern Kuriles: Paramushir Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Upper Unkanakchek R. in *Alnus fruticosa* thickets noted by Hn; lower Kusetenek R. in *Alnus fruticosa* thickets noted by Hn; Akhomten Bay noted in A. 27; Opala volcano 1040 m. July 21st 1921 Hn No. 2291; Paratun Stubendorff 1849; Bogatyrjovka Perfiljef 1910; »Podpruginski Pad», Nikolajevsk Aug. 26th 1928 Malaise; mt. Tshapochka, Natchika Komarov 1908 (Hb. Berol.); mt. Zerkalo, Natchika noted by Hn; Hutor June 26th 1928 W. Eyerdam.

East Kamtchatka: Petropavlovsk Gudzenko 1910, do. noted in A. 41, A. 129 a, A. 129 b, A. 130; between Petropavlovsk and Avatcha volcano noted by Hn; Avatcha volcano 675 m Aug. 4th 1920 Hn No. 745; Kichpinitch volcano Komarov 1909; the foot of Klutchevskaja volcano Bezais 1908.

Commander Islands: Bering Island Steller acc. to Gmel. loc. cit., Kjellman, Dobrotvorsky, Grebnitzky and acc. to Fedtsch. loc. cit. Stejneger and Morozevicz; Copper Island Dobrotvorsky and Tilman acc. to Fedtsch. loc. cit.

West and North Kamtchatka: The mouth of Itcha R. Bjeloussof 1914; Tigil Levitzky 1848.

»Kamtchatka»: Eschscholtz acc. to Herder loc. cit., Rastargujeff, Stewart, Kastalsky, Kusmischeff, Mertens, Rieder 1831.

Noted in the following associations:

In *Alnus—Calamagrostis—Dryopteris* ass.:
Single (A. 129 b); Sparse (A. 41, A. 130); Scattered (A. 129 a).
In *Alnus—Glyceria—Athyrium* ass.:
Single (A. 27).

In South Kamtchatka *C. auriculata* is comparatively common in the *Alnus fruticosa* thickets. Our species was described on the basis of Ochotsk specimens, which were probably hybrids with *C. hastata*. Maximowicz divided the species into two types α *ochotensis* and β *kamtschaticus*, of which, as far as I can see, only the last-mentioned represents the pure species. Kudo later gave β *kamtschaticus* the rank of a separate species under the name *Cacalia kamtschatica*. In my opinion it is preferable to retain the name *C. auriculata* for Maximowicz's β *kamtschaticus* instead of for his α *ochotensis*, and thus allow our plant to retain its old name, under which it is well known. This would mean that the name *Cacalia auriculata* DC. should be emended so as to represent the pure species although originally it was probably based on a hybrid between that plant and *C. hastata*. Compare also under *C. auriculata* × *hastata*.

Type of distribution: Eastern Asiatic.

Geographical area: From eastern Dahuria, Ochotsk, northern Kamtchatka and Commander Islands, southwards to northern (and central?) China, Corea and Yezo.

Cacalia auriculata × *hastata*.

Cacalia hastata α *pubescens* Ledeb., Fl. Ross. II p. 626 saltem pro parte. — *Cacalia auriculata* α *ochotensis* Maxim. in Mél. Biol. IX (1874) p. 296 saltem pro parte.

South Kamtchatka: Between Gorelaja R. and Bolshaja Topolovaja R. Komarov 1908; Korjatskaja R. near »Uski mjesta» Komarov 1908 (Hb. Holm.)

East Kamtchatka: Petropavlovsk Aug. 4th 1928 W. Eyerdam; between Petropavlovsk and Avatcha volcano 300 m. Aug. 23rd 1920 Hn No. 1044.

»Kamtchatka»: Eschscholtz.

Cacalia auriculata is a very characteristic plant with few (usually 4—6) large glabrous or glabrescent, reniform, palmately nerved stem-leaf blades (fig. 7 a, b), which do not run down along the petioles. The stem runs in a zigzag between the large stipules that are found at the base of the petioles. The corymbs are often abundantly flowered but they are short and contracted. There are five involucral scales.

C. hastata, on the other hand, has more numerous, much smaller, and on the lower surface puberulent, pennately nerved, hastate stem-leaf blades (fig. 7 g, h), which run down nearly to the base of the petioles. The stem is straight and there are no stipules. The corymbs are few-flowered and loose. There are 7—10 involucral scales. The specimens that are here taken to be hybrids between those two species are — usually in all these respects — more or less intermediate between them (cf. fig. 7). They all differ very widely from each other and form a chain connecting the two parent species. (The specimen from Petropavlovsk collected by Eyerdam (Hb. Holm.) (fig. 7 c, d) is practically intermediate between them.) The seeds are not at all, or only

very poorly, developed. No similar forms occur in western Siberia, where only *C. hastata* is present, whereas they are common in eastern Siberia. It seems probable that some of the *Cacalia* species described from northern Japan (for instance, *C. farfaraefolia* Zieb. et Zucc. and its var. *ramosa*) belong to this series.

746. *Cacalia hastata* L., Sp. pl. ed. I (1753) p. 835.

Hook. & Arnott in Beechy's Voy. p. 115; Erman, Verzeichn. p. 58; Ledeb., Fl. Ross. II p. 626 (excl. pl. ex insula Beringii et α *pubescens*); Kittlitz, Denkw. II pp. 244, 326; Herder, Pl. Radd. Monopet. No. 140 in Bull. Mosc. 40: 1 (1867) p. 420 et Radde, Reisen III: 2 p. 107 (α *pubescens*); Ditmar, Reisen I pp. 108, 552, Reisen II p. 85. — »*Kleinia caule herbaceo, foliis hastato-sagittatis . . .*» L.,

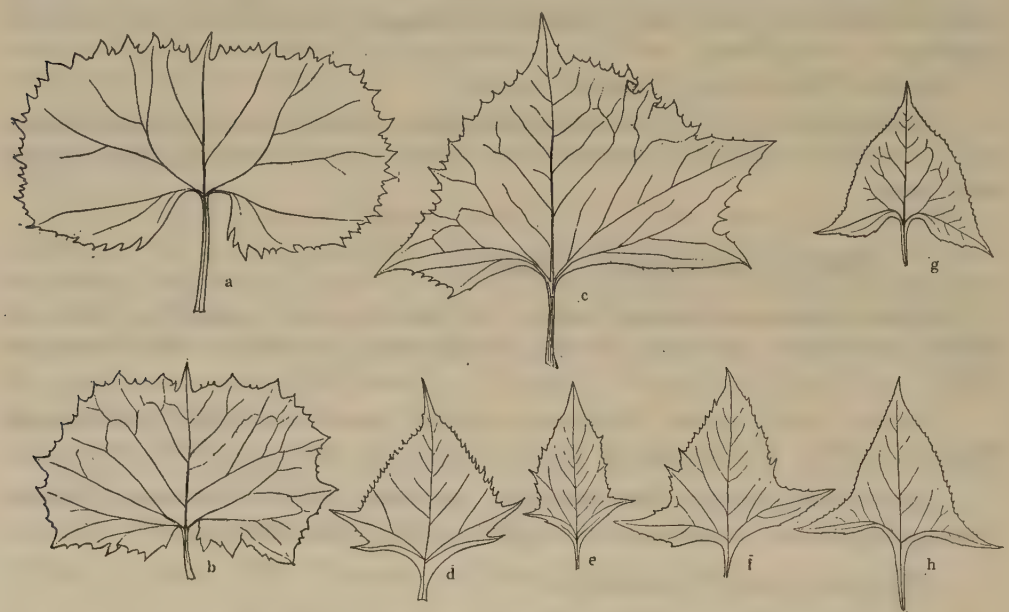


Fig. 7. Leaves of: a, b *Cacalia auriculata* (Hn No. 877); c—f different forms of *Cacalia auriculata* × *hastata* (c, d Petropavlovsk Eyerdam; e »Kamtchatka Eschscholtz»; f Korjatskaja R. Komarov 1908); g, h *Cacalia hastata* (g Hn No. 948; h Hn No. 251 c). Reduced about five times.

Amoen. Acad. II ed. 1 (1751) p. 337 (Pl. Rar. Kamtsch. p. 5) quoad pl. Kamtsch. — *Cacalia suaveolens* Pennant, Arct. zool. (1784) p. CXVI; Georgi, Beschreb., III: 5 p. 1229 — *Cacalia sagittifolia* Mertens, Bemerk. Fl. Koragins p. 63. — *Senecio sagittatus* Schultz-Bip. in Flora 27 (1845) p. 498; Maxim., Mél. Biol. IX (1874) p. 292 (α *pubescens*, β *glaber*).

South Kamtchatka: Middle Kusingen R. noted by Hn; W. of Ipelka R. noted in A. 57; lower Danilina R. noted in A. 61; S.E. of Bolsheredsk noted in A. 56; Bolsheredsk noted by Hn; between Bolsheredsk and Apatcha noted in A. 113; Apatcha noted in meadow; between Apatcha and Siku R. noted in A. 150; the mouth of Paratunka R. Aug. 11th 1920 Hn No. 828; Savoiko Komarov 1909, do. July 7th 1920 Hn No. 251 c, do. Aug. 18th 1928 Malaise; Korjatskaja R. »Uski mjesta» Komarov 1908 (Hb. Berol.).

East Kamtchatka: Petropavlovsk Rieder, do. 115 m. Aug. 18th 1920 Hn No. 948, do. Aug. 20th 1922 P. T. Novograblenof (Hb. Holm.), do. Aug. 8th 1928 W. Eyerdam; Kalashtyrka Perfiljef; between Petropavlovsk and Avatcha volcano noted in A. 17, A. 18, A. 24 a, A. 42.

Central Kamtchatka: Shtchapina Grinop 1909; Malaja Nikkolki Komarov 1909; Klutchi Afanasejev 1909.

West and North Kamtchatka: Kishtchik Rubinski 1908; Tigil Levitzky 1848; Karaginsk Island Mertens.

»Kamtchatka»: Eschscholtz, Rastargujeff and Kusmischeff all acc. to Herder loc. cit., Kastalsky, Mertens, Peters acc. to Herder loc. cit., Vossnesensky, Dybovsky.

Noted in the following associations:

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 56, A. 61); Sparse (A. 113).
In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 17, A. 18, A. 42, A. 150).
In *Betula Ermani—Filipendula—Equisetum hiemale* ass.:
Single (A. 57).
In *Betula Ermani—Filipendula—Dryopteris* ass.:
Single (A. 24 a).

In South Kamtchatka *C. hastata* is rare except on the northern border of the district. It occurs in the *Betula*-forests and in the high shady meadows of the lowlands. Compare under *C. auriculata* × *hastata*.

Type of distribution: Eurasiatic.

Geographical area: Europe: From Archangelsk, Vologda, Kostroma, Kasan and Simbirsk provinces eastwards. Asia: at Yenisej from about 69° N. lat., lower Lena and Kolyma rivers and Kamtchatka, southwards to southern Tobolsk prov., northern Mongolia, northern China, Corea and northern Honshu. Reports from Alaska are doubtful.

747. ***Senecio frigidus*** (Richards.) Lessing in Linnaea VI (1831) p. 239.

[*Cineraria frigida* Richards. in Frankl., Narr. Journ. Polar Sea, App. (1823) p. 748]; Herder, Pl. Radd. Monopet. No. 160 in Bull. Mosc. 40: 1 (1867) p. 437 et Radde, Reisen III: 2 p. 124 (α *genuina* a. *arctica*, β *robusta* b. *eriocephala*) pro parte.

East Kamtchatka: »Besimjannaja sopka» S. slope (Klutchevskaja range) July 24th 1927 P. T. Novograblenof (Hb. Holm.); the »central doll», Klutchevskaja range July 23rd 1927 P. T. Novograblenof; Ploskaja volcano Protopopof 1909.

Central Kamtchatka: Anauna R. Aug. 18th 1926 Malaise No. 335, do. Aug. 19th 1926 Malaise No. 332 and 333.

»Kamtchatka»: Eschscholtz acc. to Herder loc. cit.

Kamtchatka specimens agree well with the arctic American plant.

Type of distribution: Asiatic—Western American.

Geographical area: Europe: The northern Urals southwards to about 66° 30′, Vaigatch and Nova Zembla. Asia: along the Arctic Coast to Chukch Penins., also in Kamtchatka, the mts. at upper Bureja R., mts. in southern Irkutsk prov. and Altai. America: Banks Land, Victoria Land, along the arctic coast of Alaska eastwards to Bathurst Inlet.

748. ***Senecio integrifolius*** (L.) Clairville, Man. d'herbor. (1811) p. 241.

[*Othonna integrifolia* L., Sp. pl. ed. I (1753) p. 925]. — ?*Senecio campestris* γ Ledeb., Fl. Ross. II p. 646 quoad pl. Kamtsch. — *Cineraria campestris* Retz., Herder, Pl. Radd. Monopet. No. 162 in Bull. Mosc. 40: 1 (1867) p. 442 et Radde, Reisen, III: 2 p. 129 saltem quoad »α Ledeb.».

South Kamtchatka: The hot springs at Bannaja Aug. 2nd 1924 P. T. Novograblenof (Hb. Holm.); Hutor Komarov 1908; do. June 26th 1928 W. Eyerdam, do. June 30th 1928 Malaise, do. July 15th 1928 W. Eyerdam, do. July 19th 1928 Malaise; Savoiko Komarov 1908, do. July 4th 1928 W. Eyerdam; Korjaka Rieder 1831, do. Komarov 1908, do. Rubinski 1908, do. July 9th 1921 Hn No. 3630 (P. T. Novograblenof).

East Kamtchatka: Between Petropavlovsk and Savoiko July 9th 1920 Hn No. 417; the Kronoki Pass Komarov 1909; the foot of Klutchevskaja volcano (= Kamtschatischen Sopke) Rieder 1831.

Central Kamtchatka: Malka Komarov 1909 (Hb. Holm.); Lake Ovalni Komarov 1908; mt. Aak Komarov 1908; Pushtchina Grinop 1909, do. Komarov 1909.

»Kamtchatka»: Stewart, Kusmischeff.

This species is found in South Kamtchatka only on the N.E. border. *S. integrifolius* occurs in many forms and is here taken in its wide sense. In Kamtchatka the plants vary, especially in hairiness. No specimens are so tomentose as those from China and Mongolia, but some of them are remarkably glabrous. Beside those enumerated above some few specimens have been collected from northern Kamtchatka, which however I have not had available at the final revision. They are all doubtful and may belong to *S. Malaisei*, and not to *S. integrifolius*.

Type of distribution: Eurasiatic.

Geographical area: Europe: from N.E. Norway, Kola Penins., Kolgujev and Nova Zembla southwards to Archangelsk and Perm provinces; also from England, Denmark, southernmost Sweden and central Russia, southwards to the Alps, Austria, Crimea and Caucasus. Asia: at Yenisei from about 71° N. lat., from lower Lena R. and Kolyma, southwards to Anatolia, northern

Semiretchensk prov., Mongolia, central China and southern Japan. (Not reported from southernmost Kamtchatka, the Kuriles, Saghalin or Yezo.).

749. ***Senecio Malaisei*** nov. sp. fig. 8 et Pl. 6 fig. 1.

Rhizoma subhorizontale, gracile; caulis circiter 20 cm. altus, gracilis, costatus, pilis sparsis munitus, mono—oligocephalus. Folia glabra, inferiora longe petiolata, subspathulata, sparse dentata, superiora sessilia vel subsessilia plus minusve anguste lanceolata. Involucrum diam. 1 cm., sparse glandulosum, squamis lanceolatis. Flores radii circ. 8 mm. longi, paucinervii. Achaenia glaberrima, costata, pappo demum flores superante.



Fig. 8. Diskflower of *Senecio Malaisei*. Enlarged five times.

Central Kamtchatka: Anauna R. in *Pinus pumila*-thickets Aug. 19th 1926 MALAISE No. 322.

This plant differs from *S. integrifolius* in its glabrous leaves, glabrous achenes and long pappus. It is possible that some other specimens from northern Kamtchatka found in Russian herbaria under the name of *S. campestris* should be referred to this species, but as I have not these specimens available on my final revision of the material they must be excluded here.

Type of distribution: ?

Geographical area: So far known only from the type-locality.

Senecio nemorensis L.

LEDEB., Fl. Ross. II p. 641 (β *octoglossus*): MAXIM. in Mél. Biol. VIII (1871) p. 15 (β *octoglossus*).

LEDEBOUR cites ERMAN as the source of the report of this plant from Kamtchatka. ERMAN, however, in Verzeichn. p. 58 No. 51 mentions it as having been collected in the Urals and not in Kamtchatka. The report seems to be due to an error in the quotation of ERMAN. The plant should be excluded from the flora of our area.

750. ***Senecio palmatus*** (PALL.) LEDEB., Fl. Ross. II (1844—46) p. 636.

PALLAS, Reise III (1776) p. 321 nomen nudum; HERDER, Pl. Radd. Monopet. No. 156 in Bull. Mosc. 40: 1 (1867) p. 433 et RADDE, Reisen III: 2 p. 120 (β *Kamtschaticus*); MIYABE, Fl. Kuril. p. 244; FEDTSCH., Fl. Îl. Comm. p. 76; KOM., Voy. Kamtch. pp. 431, 451 et Fl. Penins. Kamtsch. p. 331; KUDO, Fl. Paramush. p. 171. — »*Jacobaea, Senecio major*» KRASCHENINN., Kamtsch. p. 110. — »*Solidago foliis palmatis*» GMEL., Fl. Sib. II p. 170 tab. LXXV. — *Solidago palmata* PALLAS, Reise III (1776) p. 439; GEORGI, Beschreib. III: 5 p. 1245. — ? »ein grosser mächtiger *Senecio* . . .» MERTENS, Bemerk. Fl. Koragins p. 63. — *Senecio cannabifolius* LESSING in Linnaea VI (1831) p. 242; ERMAN, Verzeichn. p. 58; DITMAR, Reisen I pp. 108, 423, 448, 552 *(Senecio)*, 740, II p. 84. — *Senecio sambucifolius* KITTLITZ, Reisen II (1858) p. 326. — »*Barannik*», DITMAR, Reisen I p. 133.

Northern Kuriles: Paramushir C. Taro 1892; S. Yokoyama 1893 both acc. to Kudo loc. cit., Kudo 1920; Shumshu acc. to Miyabe loc. cit.

South Kamtchatka: Cape Lopatka June 19th 1920 Hn No. 37; Kurile Lake noted by Hn; N.W. of Kurile Lake 500 m. noted by Hn; Ozernaja noted in A. 97; upper Unkanakchek R. noted in A. 196; middle Kusetenek R. noted in A. 194; lower Kusetenek R. noted in A. 195; near the hot springs at Unkanakchek R. noted by Hn; Sahach noted in A. 192, A. 193; middle Kusingen R. noted by Hn; the junction of Ksudach and Golygina rivers noted in A. 89, A. 90; Golygina village noted by Hn; middle Ksudach R. noted in A. 85; upper Ksudach R. noted by Hn; N. of the mouth of Golygina R. noted by Hn; the source of W. Shadutka R. noted by Hn; »the volcanic desert» at Shadutka noted by Hn; Shadutka volcano noted by Hn; Lake Sterbot noted in A. 215; between Lake Sterbot and Lake Kambolnoje noted by Hn; Topik noted by Hn; N.W. slope of Assatcha mts. noted by Hn; upper Opala R. near Assatcha noted in A. 183, A. 184; Akhomten Bay noted in A. 30; 6 km. S. of Zykovaja noted in A. 217; lower Tolmachovaja R. noted by Hn; upper Abshen R. noted by Hn; lower Bolshaja R. noted in A. 112; the mouth of Balaganchik R. noted in A. 153, A. 155; middle Karymchina R. noted by Hn; lower Karymchina R. noted in A. 124, A. 151; Danilina R. noted in A. 61; Agashka R. noted in A. 65; near the mouth of Ipelka R. noted in A. 57; Haikovaja noted by Hn; S.E. of Bolsheredsk noted in A. 56; Bolsheredsk noted in A. 53, A. 54, A. 55; between Bolsheredsk and Apatcha noted in A. 113; Apatcha noted by Hn; between Apatcha and Siku R. noted in A. 150; lower Bannaja R. noted by Hn; the hot springs at Siku R. noted in A. 122; Paratunka Stubendorff; »Perisheik», Tarja Perfiljef 1910; the mouth of Paratunka R. noted by Hn; Natchika noted by Hn; mt. Zerkalo, Natchika noted in A. 114, A. 119; lower Avatcha R. acc. to Ditmar loc. cit; Savoiko July 7th 1920 Hn No. 250 b, do. July 12th and 27th 1928 W. Eyerdam; between Natchika and Korjaka acc. to Ditmar loc. cit.; Korjaka Komarov 1908.

East Kamtchatka: Petropavlovsk Stewart, do. Dobrotvorsky 1881, do. Gudzenko 1910, do. Perfiljef 1910, do. Aug. 16th 1920 Hn No. 890; between Petropavlovsk and Avatcha volcano noted in A. 17, A. 24 a, A. 42; the shore at Semjatschik acc. to Kom. loc. cit.; the mouth of Tishaja R. Komarov 1909; Lake Kronoki Komarov 1909; Lake Assabatche Aug. 14th 1925 Malaise No. 561.

Commander Islands: Bering Island Steller acc. to Gmel. loc. cit., Kjellman and acc. to Fedtsch. loc. cit. Grebnitzky, Stejneger and Morozevicz; Copper Island Grebnitzky 1894.

Central Kamtchatka: Sharomsk Protopopof 1908; between Vershne Kamtchatsk and Milkova acc. to Ditmar loc. cit.; Kitilgina R. acc. to Ditmar loc. cit.; Shtchapina Komarov 1909; Klutchi Bezais 1908, do. Afanasejev 1909.

West and North Kamtchatka: Kishtchik Rubinski 1908; Krutugorovaja Zelenin 1909; Tigil Gudzenko 1910 and acc. to Lessing, Erman and Ditmar loc. cit.; ?Karaginsk Island acc. to Mertens loc. cit.

»Kamtchatka»: Krasheninnikoff and Steller acc. to Gmel. loc. cit., Langsdorff and Lubarsky (Hb. Fisch. sub *S. cannabifolius*), Kastalsky, Kusmischeff, Mertens, Peters, Rieder (Hb. Holm.), collector unknown (sub *S. kamtschaticus* m. Hb. Ledeb.).

Noted in the following associations:

In *Salix sachalinensis—Filipendula—Geum* ass.:
Single (A. 97, A. 112, A. 155, A. 195); Scattered (A. 53, A. 54, A. 55).
In *Alnus hirsuta—Filipendula—Dryopteris* ass.:
Single (A. 65); Sparse (A. 194).
In *Filipendula—Calamagrostis—Sanguisorba* ass.:
Single (A. 85); Sparse (A. 193).
In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 119, A. 153, A. 184); Sparse (A. 114).
In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 113, A. 122, A. 151); Scattered (A. 56, A. 61, A. 124).
In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 17, A. 150, A. 183).
In *Betula Ermani—Filipendula—Equisetum hiemale* ass.:
Sparse (A. 90); Scattered (A. 57, A. 89).
In *Betula Ermani—Filipendula—Dryopteris* ass.:
Single (A. 30); Scattered (A. 24 a, A. 196).
In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Single (A. 217); Profuse (A. 215).

This plant is very common in South Kamtchatka. It occurs in the *Filipendula* thickets of the rivers, in the high shady meadows, especially the *Angelica ursina* meadows, in the *Betula* forests, in the subalpine meadows along the western coast (the *Epilobium angustifolium—Geranium—Majanthemum* ass.) and on open spots in the *Alnus* region closely related to the last-mentioned association. Only rarely are scattered specimens found in the meadows of the lower alpine region.

S. palmatus is a very characteristic, high-grown, beautiful plant. On Aug. 22nd 1920 a specimen was measured at the mouth of the Paratunka R. and found to be 2 m. 47 cm. high. It flowers from the end of July to September. Its Kamtchatka name is »barranik», which alludes to the fact that the plant is used in the preparation of the meat of the mountain-sheep (barran). The meat is wrapped in the large leaves of our plant and boiled and the process gives it a peculiar, comparatively agreeable taste. Its old Kamtchadal name, acc. to Krascheninnikoff, was *Itschitschu*. It is doubtful whether the name *S. palmatus*, under which our plant is well known, can be retained. It

was first described and illustrated as »*Solidago foliis palmatis*» by GMELIN. PALLAS gives it (loc. cit. p. 439) a binominal name »*Solidago palmata*», citing GMELIN's description and figure. In the same work he mentions the name *Senecio palmatus* (loc. cit. p. 321) in a list, without citing any synonym or diagnosis. Although he no doubt meant by this the plant now in question, it cannot be obviously proved, and the name being a »nomen nudum», should not be used. Later (1846), however, LEDEBOUR gives a full description when citing the plant under the name of *Senecio palmatus* in Flora Rossica, and as PALLAS has given the plant the specific name *palmatus* this name should be retained even when it is transferred to the genus *Senecio* and LESSING's name *S. cannabifolius* (1831) should not be used, were it not for the fact that in the meantime no less than two other *S. palmatus* have been described (by LA PEYROUSE in 1818 and by LESSING in 1823), one of which may be valuable, as at that time no other plant bearing the name *palmatus* existed in the genus *Senecio*.

It is only possible, then, to retain the name *S. palmatus* on the assumption that when he spoke of *Solidago palmata* and *Senecio palmatus* PALLAS apparently meant one and the same plant. Otherwise the name of the plant should be *S. cannabifolius* LESS.

The Kamtchatka form of the plant, which should be regarded as the head-form, seeing that in any case its description was based on specimens from Kamtchatka, has broad leaf-lobes (β *kamtschaticus* HERDER) while the lobes of those from the Amur. Prov. are usually narrower (»α *genuinus* s. *davuricus*» HERD.).

Type of distribution: Eastern Asiatic.

Geographical area: From Transbaikalia, Olekminsk distr., Udskoj distr., northern Kamtchatka and Commander Islands, southwards to Ussuri, Shantung and Honshu. HERDER's report from Sitka is probably erroneous.

751. ***Senecio palustris*** (L.) HOOK., Fl. bor.-Amer. I (1833) p. 334.

var. ***congestus*** (R. BR.) HOOK. loc. cit.

BONG. & MEYER in Verz. Saisang-Nor u. Irtüsch ges. Pfl. (Fl. Altaica Suppl. II) (1841) p. 40; LEDEB., Fl. Ross. II p. 648. — [*Cineraria palustris* L., Sp. pl. ed. II (1763) p. 1243]; HERDER, Pl. Radd. Monopet. No. 165 in Bull. Mosc. 40: 1 (1867) p. 446 et RADDE, Reisen III: 2 p. 133 (γ *lacerata*).

East Kamtchatka: Svetloj Klutch R. (near Savoiko) KOMAROV 1908, do. July 28th 1928 P. T. NOVOGRABLENOF; Kalashtyrka Lake RIEDER 1831, do. Aug. 16th 1923 P. T. NOVOGRABLENOF, do. Aug. 1927 ADAMOFF; the mouth of Vahil R. KOMAROV 1909.

»Kamtchatka»: STELLER acc. to HERDER loc. cit.

The Kamtchatka specimens of this plant have heads that are agglomerate in hemispherical clusters and, as already pointed out by BONG. & MEYER loc. cit., should be referred to the arctic and American var. *congestus* (R. BR.) HOOK. fil. (= *Cineraria congesta* R. BR. in Suppl. to Appendix PARRY's first

voyage 1824 p. CCLXXIX). They are very high-grown, acc. to a note on the specimen collected by NOVOGRABLENOF, about 1,5 m. high.

Type of distribution: Circumpolar.

Geographical area: Europe: From southern England, southern Sweden, Esthonia, East Petersburg prov., Moskovsk, Nishnegorodsk, southern Simbirsk, Ufa and southern Perm provinces, southwards to northern France, northern Germany, Hungary, Charkov, Saratov and Orenburg provinces, also (var. *congestus*) on Kolgujev, Samoyede Land, Vaigatch and Nova Zembla. Asia: along the Arctic Coast (var. *congestus*) to Chukch Penins. southwards in Western Siberia to about the Arctic Circle, in eastern Siberia to Kamtchatka, Ussuri and Transbaikalia, in southern Siberia (not var. *congestus*) also from middle Obi, southern half of Tomsk prov., Yenisei from about 56° N. lat. and Irkutsk prov., southwards to northern Akmolinsk prov. and N.E. Semipalatinsk prov. America (var. *congestus*): from the north coast of Alaska, Banks Land, and Baffin Land (73° N. lat.), southwards to Saskatchewan (52° N. lat.) Iowa, mouth of St. Lawrence R. and Labrador (51° N. lat.).

752. ***Senecio pseudoarnica*** LESS. in Linnaea VI (1831) p. 240 *(Pseudo-Arnica)*.

LEDEB., Fl. Ross. II p. 642; HERDER, Pl. Radd. Monopet. No. 159 in Bull. Mosc. 40: 1 (1867) p. 436 et RADDE, Reisen III: 2 p. 123 (*Pseudoarnica*) (β *major*); YABE & YENDO, Fl. Shimushu p. (197); FEDTSCH., Fl. Îl. Comm. p. 76; KUDO, Fl. Paramush. p. 171 (also var. *Kurilensis* KUDO). — »*Aster seu potius Helenium maritimum . . .*» GMEL., Fl. Sib. II p. 175. — *Arnica maritima* L., Sp. pl. ed. I (1753) p. 884; GEORGI, Beschreib. III: 5 p. 1249; MERTENS, Bemerk. Fl. Koragins p. 61. — »*Aster* GM. Sib. II 186 No. 152» PENNANT, Arct. Zool. (1784) p. CXVI. — *Senecio maritima* HULTÉN, Fl. Kamtsch. adj. isl. I p. 24 (non L. fil., nec REICHENB.).

Northern Kuriles: Paramushir C. TARO 1892 and S. YOKOYAMA 1893, KUDO 1920; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka collected by cosacks, do. west coast June 19th 1920 HN No. 70, do. June 24th 1920 HN No. 127 a; the mouth of Javina R. noted by HN; the mouth of Opala R. noted by HN; Akhomten Bay Sept. 8th 1920 HN No. 1185 (A. 24 b); near the mouth of Bolshaja R. KOMAROV 1908, do. noted in A. 44; Bogatyrjovka July 16th 1920 HN No. 430.

East Kamtchatka: Petropavlovsk GUDZENKO 1910, do. PERFILJEF 1910, do. Aug. 20th 1922 P. T. NOVOGRABLENOF (Hb. Holm.), do. Aug. 1st 1928 W. EYERDAM; the mouth of Tishaja R. KOMAROV 1909; Ustj Kamtchatsk BEZAIS 1908, do. PROTOPOPOF 1909, do. July 1925 MALAISE No. 562.

Commander Islands: Bering Island STELLER acc. to GMEL. loc. cit., GREBNITZKY 1894, and acc. to FEDTSCH. loc. cit. STEJNEGER and MOROZEVICZ; Copper Island TILMAN acc. to FEDTSCH. loc. cit.

West and North Kamtchatka: the mouth of Krutogorovaja R. RUBINSKI 1908; Oblukovina ZELENIN 1909; the mouth of Tigil R. LEVITSKY 1848; Karaginsk Island acc. to MERTENS loc. cit.

»Kamtchatka»: STELLER and KRASCHENINNIKOF acc. to GMEL. loc. cit., RASTARGUJEFF, STEWART, KASTALSKY, PETERS 1831, RIEDER 1833.

Noted in the following association:

In *Elymus* ass.:
Sparse (A. 24 b, A. 44).

In South Kamtchatka this plant is common in the *Elymus* belt on sandy soil along the shores of both the eastern and the western coast. It flowers from the middle of July to the middle of September. Its Kamtchatka name is »Starik» (= old man).

Type of distribution: Bicentric: Northern Pacific and Eastern American.

Geographical area: Asia: along the coast from the Bering Straits southwards (on both sides of the Ochotsk Sea) to southern Yezo (MATSUMURA reports it also from one locality in Honshu, but KUDO (1925 p. 281) only from Yezo), Saghalin and South-Ussuri. America: from Alaska 67° N. lat. southwards to British Columbia 50° N. lat. and from Labrador 55° N. lat. to New Brunswick 45° N. lat. A map of the distribution is given by FERNALD in Mém. Gray. Herb. II (1925) p. 259; to this should be added localities at Gishiga and the western coast of Kamtchatka.

753. ***Senecio resedifolius*** LESS. in Linnaea VI (1831) p. 243.

HERDER, Pl. Radd. Monopet. No. 152 in Bull. Mosc. 40: 1 (1867) p. 429 et RADDE, Reisen III: 2 p. 116 (*resedaefolius, α genuina, γ multicaulis, δ multiflora*).

South Kamtchatka: Topik 580 m. July 28th 1921 HN No. 2469.

East Kamtchatka: Ploskaja volcano, »Pervaja na dolu sopotchka» PROTOPOPOF 1909; the Chartchina mts PROTOPOPOF 1909, do. Aug. 12th 1927 MALAISE.

Central Kamtchatka: Gremushej R. KOMAROV 1908; Mt. Aak KOMAROV 1908; Anauna R. Aug. 19th 1926 MALAISE No. 336.

West and North Kamtchatka: Karaginsk Island MERTENS acc. to HERDER loc. cit.

»Kamtchatka»: Collector unknown »Hb. PALL., Hb. FISCH.» (sub *S. heterophyllus*); collector unknown several other specimens; RIEDER acc. to HERDER loc. cit. (»Bucht bei Krest» cited by HERDER loc. cit. as lying in Kamtchatka is situated north of our area).

In South Kamtchatka *S. resedifolius* was seen only at the above mentioned locality, which is the southernmost point at which it hitherto is known on that longitude.

The plant is very multiform in Kamtchatka, as well as in other parts of its area (Compare FERNALD in Rhodora 26 (1924) p. 113). The bulk of the specimens from Topik and the specimen from Chartchina agree remarkably well with the description of *S. ovinus* GREENE (Pittonia 4, 1900 p. 110; compare GREENMAN in Ann. Missouri Bot. Gard. III, 1916 p. 100), to which I

originally referred them. It is apparent, however, that the Kamtchatka plant is connected with other forms of *S. resedifolius* and cannot be regarded as a separate species. I have not seen any authentic material of the American *S. ovinus*, but it must be very closely related to certain forms of *S. resedifolius*.

Type of distribution: Bicentric: Asiatic—Western American and Eastern American.

Geographical area: Europe: Vaigatch. Asia: along the Arctic Coast (near the mouths of the Yenisei, Taimyr, Olenek, Lena and Kolyma rivers) to Chukch Penins., southwards to Vilju distr., Ajan and southern Kamtchatka, also in Altai, Tannu Ola, southern Irkutsk prov. and mts. around Lake Baikal. America: from Kotzebue Sound and the north coast of Alaska (Herschel Island) southwards to the Aleutian Islands, also in E. America, on the southern part of Newfoundland and in Gaspé penins. In Alberta, British Columbia and Montana the very closely related *S. ovinus* Greene. A map of the distribution is given by Fernald in Mem. Gray Herb. II (1925) p. 259. As that map does not comprise the whole circumpolar belt, stations at the mouth of Yenisei R., at Vaigatch and in Altai should be added.

754. ***Senecio tundricola*** Tolmatchew in Comptes Rendus Acad. Sc. U.R.S.S. 1928 p. 266.

Cineraria frigida Herder, Pl. Radd. Monopet. No. 160 in Bull. Mosc. 40: 1 (1867) p. 437 et Radde, Reisen III: 2 p. 124 quoad pl. Kamtsch. pro parte. — *Senecio aurantiacus* Kom., Voy. Kamtch. pp. 87, 453. — *Senecio kamtschaticus* Kom. in sched. pro maxime parte.

East Kamtchatka: Kronoki Pass Komarov 1909; N.E. slope of Klutchevskaja volcano 1000 m. P. T. Novograblenof 1927 (Hb. Holm.); Ploskaja volcano Protopopof 1909; »Auf der Kamtschatischen sopke» (= Klutchevskaja volcano) Rieder 1831.

Central Kamtchatka: Gremushej R. Korjatskaja volcano July 17th (old style) 1908 (Hb. Holm. sub *S. frigidus* β *robustus* Herd.).

»Kamtchatka»: Bogdanovitsch 1895 acc. to Tolmatchew loc. cit.

This plant may be said to come between *S. frigidus* and *S. campestris*. If, as is probable, it is identical with *S. integrifolius* var. *Lindströmii* Ostenf. (Compare Tolmatchev loc. cit.), its geographical area is practically the same as that of *S. frigidus*. *S. Kawakamii* Makino from Saghalin and Yezo must be a related form, which, acc. to the description, differs in its subumbellate inflorescence and glabrous achenes.

Type of distribution: ? Asiatic, transgressing into W. America.

Geographical area: (acc. to Tolmatchew loc. cit.) from the Gyda tundra eastwards to Kolyma and Anadyr, northern Kamtchatka, Ochotsk distr. (Ola), Altai and Sayan mts. Arctic America?

Senecio vulgaris L., Sp. pl. ed. I (1753) p. 867.

East Kamtchatka: Petropavlovsk at the farm Aug. 22nd 1922 P. T. NOVOGRABLENOF.

The plant was certainly introduced together with grain and occurred occasionally at the experimental farm at Petropavlovsk.

Cineraria sibirica L.

PENNANT Arct. Zool. (1784) p. CXVI; GEORGI, Beschreib. III: 5 p. 1246. — »*Solidago foliis cordatis, subrotundis* . . .» GMEL., Fl. Sib. II p. 169.

This plant was recorded from Kamtchatka by GMELIN loc. cit. STELLER was cited as the collector. Even LEDEBOUR seems to have realized that the report was incorrect. The plant should be excluded from the flora of our area.

Arctium Lappa L., Sp. pl. ed. I (1753) p. 816.

[*Lappa major* GAERTN., De fruct. et sem. II (1791) p. 379].

East Kamtchatka: Petropavlovsk, the main street Okt. 13th 1924 P. T. NOVOGRABLENOF (Hb. Holm.).

This plant was occasionally introduced into Petropavlovsk. It is a European plant, which occurs introduced in Siberia, in eastern Asia (in Amur and Primorsk provinces, Corea, in Saghalin and in Japan), and in N. and S. America.

Saussurea glomerata POIR.

LEDEB., Fl. Ross. II p. 664. — *Saussurea amara* α *typica* b. *orientalis* et β *glomerata* HERDER, Pl. Radd. Monopet. No. 190 in Bull. Mosc. 41: 2 (1868) p. 47 et RADDE, Reisen III: 3 p. 47.

LEDEBOUR names MERTENS as the collector of this species in Kamtchatka. Even HERDER loc. cit. doubts the correctness of the report. The plant should be excluded from the flora of our area.

Saussurea nuda LEDEB., Icon. Plant. nov. fl. Ross. I (1829) p. 15 tab. 61.

LEDEB., Fl. Altaica IV p. 16 in nota: LEDEB., Fl. Ross. II p. 662.

LEDEBOUR cites ESCHSCHOLTZ and HOOK. & ARNOTT as having collected this plant in Kamtchatka. The plant of HOOK. & ARNOTT, which LEDEBOUR probably had not seen and which was collected at »Avatcha Bay», was doubtless *S. Tilesii,* which is common there and is the only *Saussurea* species occurring in the vicinity. LEDEBOUR probably referred it to *S. nuda* because HOOK. & ARNOTT had associated it with »*S. alpina*», in which species they also included the plant from Kotzebue Sound, which was *S. nuda.* The plant is otherwise not known from our area but might be expected in its northern part.

755. ***Saussurea oxyodonta*** nov. sp. fig. 9 a et Pl. 4 fig. a.

Saussurea Ledebouri γ *Kruhseana* HERDER, Pl. Radd. Monopet. No. 187 in Bull. Mosc. 41:2 (1868) p. 43 et RADDE, Reisen III: 3 p. 43. — ?»*Saussurea Tilesii?*» YABE & YENDO, Fl. Shimushu p. (197). — ?*Saussurea Tilesii* var. *kurilensis* KUDO, Fl. Paramush. p. 172. — *Saussurea subsinuata* KOM. in herb. pro parte.

Rhizoma adscendens, 3—10 mm. crassum. Planta juvenilis albo-arachnoidea dein glabrescens. Caulis polyphyllus, 10—50 cm. altus, costatus, glandulosus. Folia supra glabra vel parce glandulosa, subtus (costa glandulosa excepta) glabra vel sparse glandulosa, marginibus glanduloso-ciliata. Folia infima marcescentia, inferiora longe petiolata (petiolo circ. 6 cm. longo), ovato-lanceolata, apice acuta, basi subcuneata—rotundata, inaequaliter dentata, dentibus acuminatis, intermedia brevius petiolata, summa sessilia, plus minusve anguste lanceolata, integerrima. Anthela corymbosa, polycephala, pedunculis crebre glandulosis, involucro arachnoidea, squamis extimis paucis, anguste lanceolatis, longe acuminatis, summas aequantibus, intermediis e basi late ovata lanceolatis acuminatis, intimis late lanceolatis — fere linearibus, breve acuminatis, dorso et praecipuo apice albido-villosis. Receptaculum setosum, setis longis. Achaenia glabra, pappo fulvescente, setis extimis tertiam longitudine partem caeterorum aequantibus.

A *Saussurea Tilesii* differt: foliis subtus non tomentosis, marginibus ciliatis, forma squamarum involucri, distributio geographica etiam omnino alia. A *S. subsinuata* recedit: configuratione foliorum, dentibus acuminatis, forma squamarum involucri et receptaculo setoso.

Northern Kuriles: ?Paramushir KUDO 1920; ?Shumshu YENDO 1903 acc to KUDO loc. cit.

South Kamtchatka: Cape Lopatka June 17th 1920 HN No. 20; N.E. of Javina noted by HN; S. of Kochegochek noted by HN; Sahach Aug. 16th 1922 HN No. 4282 (A. 191, A. 192); do. noted by HN; upper Kusingen R. noted in A. 190; Golygina R. at the junction with Ksudach R. noted by HN; Golygina R. 25 verst above the village RUBINSKI 1909 (sub *S. subsinuata* KOM.); Golygina village Aug. 8th 1921 HN No. 2768; upper Ksudach R. noted in A. 83, A. 84; middle Ksudach R. noted in A. 86; Shadutka volcano 1125 m. Aug. 2nd 1921 HN No. 2585; upper Savan R. Aug. 1st 1921 HN No. 2549 (A. 79); Topik 580 m. July 28th 1921 HN No. 2472; Assatcha mts. 1100 m. Aug. 10th 1922 HN No. 4188; N.W. slope of Assatcha mts. noted in A. 177; Assatcha mts. at the sources of Opala R. July 31st 1922 HN No. 4080 (A. 183, A. 184. A. 185); the hot springs at upper Opala R. Aug. 4th 1922 HN No. 4150 (A. 182); upper Udoshk R. noted in A. 78 b; Opala volcano 1040 m. July 21st 1921 HN No. 2316; N.W. of Opala volcano noted in A. 66, A. 67, A. 68; Tolmachovaja R. noted in A. 157; upper Abshen R. 250 m. July 17th 1921 HN No. 2192; the mouth of Balaganchik R. noted in A. 152, A. 154; lower Karymchina R. noted in A. 151; between Apatcha and Siku R. noted in A. 150; Apatcha KOMAROV 1908 (sub *S. subsinuata*) (Hb. Berol.).

West and North Kamtchatka: Utka Rubinski 1908 (sub *S. subsinuata*); Krutogorovaja Zelenin 1908 (sub *S. subsinuata*); between Sedanka and Jelovka Aug. 20th 1927 Vavilin (Hb. Holm.); Tigil Bezais 1909 (Hb. Holm.); Pallan Savtchenko 1911 (sub *S. subsinuata*).

»Kamtchatka»: Wright 1853—56 (sub *S. Tilesii*).

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 66, A. 78 b, A. 84, A. 184, A. 185); Sparse (A. 67, A. 68, A. 79, A. 83, A. 86); Scattered (A. 182, A. 190, A. 191).
In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 151).
In *Betula platyphylla—Thalictrum—Carex* ass.:
Single (A. 152, A, 154); Scattered (A. 157).
In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 150, A. 183).
In *Carex—Sanguisorba*—Moss ass.:
Single (A. 192).
In *Artemisia arctica—Solidago—Salix arctica* ass.:
Single (A. 177).

Westwards from a line running from somewhat south of Akhomten Bay over Natchika and along the western part of the central mountain range, *S. oxyodonta* is common, whereas it does not occur to the east of this line. In South Kamtchatka it occurs in the meadows of the lowlands, and in the *Betula Ermani* forests. It also occurs in the alpine region, although more rarely. The lowland plant is high-grown (40—50 cm. high) with large leaves (the middle stem-leaves about 9×2 cm.), glabrous underneath, except on the median vein, while the alpine form is low-grown (often about 15 cm. high) with smaller, often somewhat narrower leaves (the middle stem-leaves about 5×0,7 cm.), glandular underneath and with not so prolonged teeth. The lowest stem-leaves, which are usually withered in the lowland specimens, are sometimes present and are then broader than the others, the base of the blades beeng practically truncate. Besides these a third type was collected belonging to our species. It was found in a small, limited area on the western Shadutka river. It is a very high-grown plant (up to more than 1 metre high) with very rich and dense inflorescence and often very numerous sessile leaves running down the stem. Otherwise it agrees in every respect with our plant. It may be described as a new variety:

var. ***elata*** nov. var.: Elatior, rhizomate crassiore (10—15 mm. crasso), caule pleiophyllo foliis aut petiolatis aut sessilibus et basi decurrentibus, nec non anthela pleiocephala.

South Kamtchatka: W. Shadutka R. 200 m. Aug. 4th 1920 Hn No. 2638 b, c and d.

The geographical area of our plant is not yet clear. It might be expected at Ochotsk.

Type of distribution: ? Eastern Asiatic.

Geographical area: Known from Gishiga, W. shore of Gishiga Bay (BJELOUSSOF sub *S. subsinuata*), the western and southern part of the Kamtchatka peninsula and ? the northern Kuriles only. Possibly some of the plants reported as *S. Tilesii* from Yezo belong to our species. Compare under *S. Tilesii*.

Saussurea pycnocephala LEDEB.

LEDEB., Fl. Ross. II p. 661. — »*Serratula foliis lanceolatis oblongis, denticulatis*» GMEL., Fl. Sib. II p. 82. — *Vernonia noveboracensis* WILLD., Sp. pl. III p. 1632 quoad pl. Kamtsch.; SPRENG., Syst. Veg. III p. 436 quoad pl. Kamtsch. — *Serratula noveboracensis* PENNANT, Arct. Zool. (1784) p. CXVI; GEORGI, Beschreib. III: 5 p. 1219.

The source of all the above reports of this plant from Kamtchatka is apparently GMELINS' account. GMELIN quotes KRASCHENINNIKOFF as collector. *S. pycnocephala* is an Altai plant and should be excluded from the flora of our area.

756. ***Saussurea Riederi*** HERDER, Pl. Radd. Monopet. No. 185 in Bull. Soc. Nat. Mosc. 41: 2 (1868) p. 35 et RADDE, Reisen III: 3 (1869) p. 35.

MAXIM. in Mél. Biol. IX (1874) p. 343; YABE & YENDO, Fl. Shimushu p. (197); KOM., Voy. Kamtch. p. 415 et Fl. Penins. Kamtsch. I p. 333; KUDO, Fl. Paramush. p. 173; HULTÉN in Sv. Bot. Tidskr. 22 (1928) p. 228.

Northern Kuriles: Paramushir C. TARO 1892, S. YOKOYAMA 1893, KUDO 1920 all acc. to KUDO loc. cit.; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka, west coast June 22nd 1920 HN No. 86 a; the mouth of Kambolnaja R. RUBINSKI 1908; Kurile Lake at the estuary of the river Aug. 28th 1922 HN No. 4444, do. noted in meadow by HN; the mouth of Ozernaja R. RUBINSKI 1909, do. GUDZENKO 1910; lower Ozernaja R. noted in A. 96, A. 100; between Javina and Kochegochek Aug. 14th 1920 HN No. 2873, do. noted in A. 91, A. 92; S. of Golygina village noted in meadow by HN; between the mouths of Golygina and Opala rivers Sept. 10th 1922 HN No. 4559; »Bei der Hadutka auf einer feuchten Ebene im J. 1831 gesammelt RIEDER» acc. to HERDER loc. cit.; Lake Sterbot noted in A. 216; between Lake Sterbot and Lake Kambolnoje noted in »subalpine meadow» by HN.

»Kamtchatka»: RIEDER (sub *S. serrata* DC. *pygmaea*, *S. triangulata* TRAUTV. & MEY. and *S. Riederi* written by HERDER).

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Sparse (A. 100); Scattered (A. 91, A. 92, A. 96).

In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Single (A. 216).

S. Riederi is comparatively common within a small area in South Kamtchatka along the western coast, especially in its southern part. It occurs in the meadows and in the subalpine meadows along the coast (the *Epilobium angustifolium—Geranium—Majanthemum* ass.). It is the most characteristic of the *Saussurea* species in Kamtchatka, with its small heads (fig. 9 c) in flat corymbs, triangular leaf-blades varying between slightly broader and slightly narrower than long, and with winged petioles.

Type of distribution: Asiatic Pacific.

Geographical area: Southernmost Kamtchatka, the Kuriles, Yezo, Honshu and Sikoku.

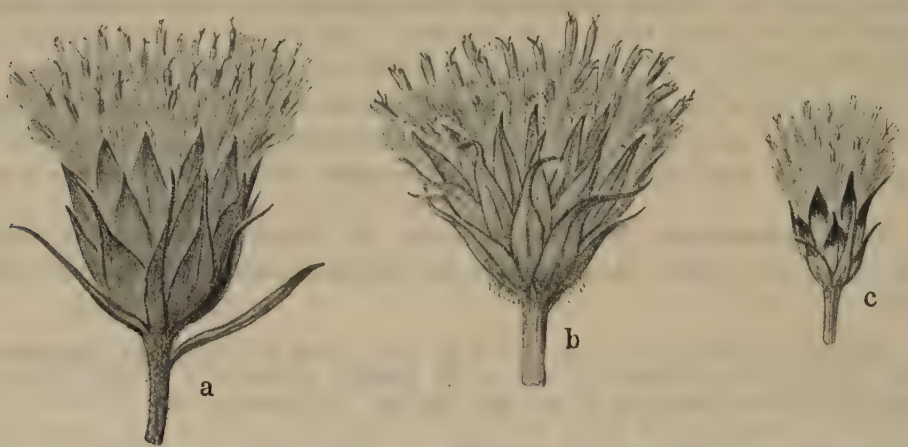


Fig. 9. Heads of a. *Saussurea oxyodonta* (HN No. 4282); b. *Saussurea subsinuata*; c. *Saussurea Riederi* (HN No. 2873). All enlarged twice.

757. ***Saussurea subsinuata*** LEDEB., Icon. Plant. nov. fl. Ross. I (1829) p. 15 tab. 62.

LEDEB., Fl. Altaica IV p. 16 in nota; LEDEB., Fl. Ross. II p. 662. — *Saussurea Ledebouri* HERD. β *subsinuata* HERDER, Pl. Radd. Monopet. No. 187 in Bull. Mosc. 41: 2 (1868) p. 41 et RADDE, Reisen III: 3 p. 41. — *Saussurea nuda* var. *subsinuata* FEDTSCH., Fl. Îl. Comm. p. 77. — *Saussurea Morozeviczi* FEDTSCH., Fl. Îl. Comm. p. 77.

Northern Kuriles: Paramushir Musashiwan BERGMAN 1929.

South Kamtchatka: Akhomten Bay 500 m. Sept. 13th 1920 HN No. 1371.

East Kamtchatka: Uzon KOMAROV 1909; the Kronoki Pass KOMAROV 1909 (sub *S. nuda*); Siminaja volcano (Klutchevskaja range) July 23rd 1927 P. T. NOVOGRABLENOF (Hb. Holm.); »auf Ebenen und Bergen an der östlichen Küste» RIEDER acc. to HERDER loc. cit.

Commander Islands: Bering Island GREBNITZKY 1897 (sub *S. nuda* var. *subsinuata*), STEJNEGER acc. to FEDTSCH. loc. cit., MOROZEVICZ 1903 (sub *S. Morozeviczi*); Copper Island DYBOVSKY 1879 (sub *S. nuda* var. *subsinuata*), STEJNEGER and MOROZEVICZ acc. to FEDTSCH. loc. cit.

Central Kamtchatka: Anauna R. Sept. 5th 1926 MALAISE No. 331.

»Kamtchatka»: TILESIUS (determined by LEDEBOUR, type of the species), KUSMISCHEFF, RIEDER No. 196 1831.

This northern plant I saw only once in South Kamtchatka. It differs from *S. oxyodonta* in its glabrous receptacle, its acute inner involucral scales with dense yellowish hairiness at the apex (fig. 9 b), the form and dentation of the leaves and so on. LEDEBOUR's figure loc. cit. is not particularly good, as only the upper part of an unusually large specimen is illustrated, and the characteristic broad, practically obtuse lower leaves, cuneate at base and with few large teeth, are not shown. The margin of the leaves on the specimen from which the drawing was made was rolled back, so that the true configuration of the leaves is not seen from the figure. LEDEBOUR's type-specimen, however, shows that the type to which the specimens enumerated above belong is his *S. subsinuata*.

S. Morozeviczi described from Bering Island by B. FEDTSCHÉNKO, who has kindly placed a specimen from his herbarium at my disposal, differs from the common type of our species in being very low-grown and in having the leaves strongly glandulose on the lower surface, the lower ones having a truncate to nearly heart-shaped base. It seems, however, to be nothing but a stunted monocephalous form of *S. subsinuata*, corresponding to similar forms of *S. Tilesii* (compare below).

Type of distribution: ?Eastern Asiatic—Western American.

Geographical area: Asia: Chukch penins., Anadyr, E. Kamtchatka, Commander Islands, the northern Kuriles, Ochotsk and Ajan distr. America: Kotzebue Sound. In W. America the related *S. densa* HOOK.

758. ***Saussurea Tilesii*** (LEDEB.) LEDEB., Icon. plant. nov. fl. Ross. I (1829) p. 15 tab. 60.

LEDEB., Fl. Altaica IV p. 15 in nota; LEDEB., Fl. Ross. II p. 662. — *Serratula Tilesii* LEDEB. in Mém. Ac. Imp. Sc. St. Petersb. V (1812) p. 562. — *Saussurea alpina* HOOK. & ARNOTT in Beechy's Voy. p. 116. — *Saussurea alpina* δ *maxima* LEDEB., Fl. Ross. II p. 669. — *Saussurea Ledebourii* δ *Tilesii* quoad pl. Kamtsch. et ε *exaltata* HERDER, Pl. Radd. Monopet. No. 187 in Bull. Mosc. 41: 2 (1868) p. 41 et RADDE, Reisen III: 3 p. 41. — *Saussurea Tilesii* var. *exaltata* MAXIM., Prim. Fl. Amur. in Mém. Ac. Imp. Sc. St. Petersb. par div. sav. IX (1859) p. 170. — *Saussurea eriolepis* f. *caudata* KJELLMAN, Komm. faner. fl. p. 292; FEDTSCH. Fl. Îl. Comm. p. 78. — *Saussurea grandifolia* f. *caudata* KJELLMAN, Komm. faner. fl. p. 291; FEDTSCH., Fl. Îl. Comm. p. 78. — *Saussurea nuda* var. *exaltata* (MAXIM.) TRAUTV., FEDTSCH., Fl. Îl. Comm. p. 77.

South Kamtchatka: Akhomten Bay Aug. 30th 1920 HN No. 1180 (MALAISE), do. Sept. 9th 1920 HN No. 1195 (A. 31, A. 37 a, A. 37 b); Mutnovskaja volcano July 28th 1922 HN No. 4048, and 4049; Gorelaja volcano noted in A. 167, A. 173 (first flower for the season on July 22nd 1922); Lake Tolmachovaja noted in A. 160; the Kohelok mt. 660 m. noted in A. 125; upper (Paratunka-) Bystraja R. Sept. 13th 1921 HN No. 3200 (A. 128); Paratunka

Komarov 1908; Tarja Bay Komarov 1908; Toporkof Island Aug. 15th 1920 Hn No. 895; the mouth of Paratunka R. Aug. 11th 1920 Hn No. 838; mt. Krasni gor, Lake Natchika Komarov 1908; the Shalsan Pass 700 m. Sept. 1st 1925 Hn No. 2985 d (a fragment only, a very doubtful form probably a hybrid with *S. oxyodonta*); Natchika Komarov 1908; mt. Zerkalo, Natchika Komarov 1908, do. noted in A. 118, A. 119; Savoiko Aug. 30th 1928 Malaise; Avatcha Bay acc. to Hook. & Arnott loc. cit.

East Kamtchatka: Petropavlovsk Mertens, do. Perfiljef 1910, do. July 2nd 1920 Hn No. 170, do. Aug. 18th 1920 Hn Nos. 939, 966, 968, do. July 12th and 23rd and Aug. 15th 1928 W. Eyerdam; between Petropavlovsk and Avatcha volcano Aug. 22nd 1920 Hn No. 995, do. noted in A. 7, A. 9, A. 16, A. 17, A. 18, A. 23, A. 42, A. 43; Avatcha volcano Perfiljef 1911, do. Aug. 2nd 1920 Hn No. 696, do. 1200 m. noted by Hn, do. Aug. 25th 1928 W. Eyerdam; Nalutcheva Perfiljef 1910; Kichpinitch volcano Komarov 1909; mt. Krasheninikoff Komarov 1909; betwen mt. Krasheninnikoff and Uzon Komarov 1909; Uzon Komarov 1909, Lake Kronoki Komarov 1909; the Kronoki Pass Komarov 1909 (f. *subacaulis*); Klutchevskaja volcano 3000 and 3600 feet Bezais 1909; Lake Asabatche Aug. 15th 1923 Malaise No. 558 and 559; Ustj Kamtchatsk July 30th 1925 Malaise No. 560; Cape Kamtchatka Sept. 1846 Vossnesenky (sub *S. denticulata*).

Commander Islands: Bering Island Vossnesensky (sub *S. denticulata*), Kjellman sub *S. eriolepis* f. *caudata* (Hb. Upsala) and sub *S. grandifolia caudata* (Hb. Upsala), Dybovsky 1879, Grebnitzky 1894 (sub *S. Tilesii* var. *exaltata* Maxim. and *S. nuda* var. *exaltata*).

Central Kamtchatka: The Ganala »tundra» Aug. 25th 1924 P. T. Novograblenof; Shtchapina Komarov 1909, do. July 25th 1921 Hn No. 3482; Malaja Nikkolki Komarov 1909; Anauna R. Aug. 19th 1926 Malaise Nos. 325, 326 (f. *subacaulis*) and 327, do. Sept. 5th 1926 Malaise No. 328 (f. *subacaulis*) and 330; Klutchi Bezais 1908 (Hb. Berol.); Tchuchovka mts. Bezais 1908 (Hb. Holm.).

»Kamtchatka»: Tilesius »*Serratula Tilesii* mihi Kamtschatka Ledeb. ic. pl. ross. alt. illustr. Tab. 60» (Hb. Berol.); Langsdorff; »*S. Tilesii* β *exaltata* C. A. Mey. mscr. Herb. Fisch.» (judging from the type of the label the specimen was collected by Rastargujeff but is cited by Maxim. loc. cit. and after him by Herder loc. cit. as collected by »Ricord»); Stewart; Mertens (also sub *S. alpina* δ *maxima* Hb. Ledeb.); Rieder.

Noted in the following associations:

In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 7, A. 17, A. 23); Sparse (A. 18, A. 42); Scattered (A. 9, A. 43).

In *Thalictrum—Sanguisorba—Carex* ass.:
Scattered (A. 119).

In *Vaccinium—Empetrum*—Moss ass.:
Single (A. 16).

In *Vaccinium—Empetrum*—Lichen ass.:
Single (A. 160).

In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Scattered (A. 125); Abundant (A. 118).

In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Sparse (A. 31, A. 37 b); Scattered (A. 37 a, A. 128).

In *Vaccinium—Empetrum—Rhododendron chrysanthum* ass.:
Single (A. 167, A. 173).



Fig. 10. Heads of *Saussurea Tilesii* (a HN No. 696; b HN No. 939). Enlarged twice.

S. Tilesii occurs in eastern and south-eastern Kamtchatka east of a line from somewhat south of Akhomten Bay over Natchika and the central mts. It differs from *S. oxyodonta* and *S. subsinuata* as follows: from the first-mentioned in its white tomentum on the underside of the leaves and also in its long acuminated inner involucral scales (fig. 10), and from the last-mentioned in its setose receptacle. Like *S. oxyodonta*, which is replaced by our species in the eastern part of the Kamtchatka peninsula, it occurs in two fairly widely differing forms, viz. a high-grown lowland form and a low-grown alpine form. It was the latter that was named *S. Tilesii* by LEDEBOUR. The lowland form (f. *exaltata*), named *S. Ledebourii* ε *exaltata* by HERDER loc. cit., is about 50 cm. high with very broad, large (about 180×65 mm.), long-petiolated (up to 15 cm.) lower leaves (often with looser tomentum on the underside), and looser corymbs, while the alpine form is lower-grown (about 15—25 cm.) with smaller and narrower (about 100×25 mm.) lower leaves with shorter petioles (3—4 cm)

strongly tomentose beneath and with a contracted and sometimes practically capitate corymb.

In high altitudes there rarely occurs a sub-caulescent single-flowered plant (f. *subacaulis* Kom. in herb.) which it is only with some hesitation that I refer to this species. Apart from its peculiar habitus, it has very large heads and narrow involucral scales, but as it agrees in other respects with *S. Tilesii* it might be referred to that species.

Type of distribution: ?Endemic.

Geographical area: Eastern Kamtchatka and Commander Islands. The species might be expected in the Aleutian Islands and in southern Alaska.

Without seeing the specimens it is impossible to form any opinion as to which species the plants reported as *S. Tilesii* from Yezo should be referred to. At least part of them may belong to *S. oxyodonta*, while part of them apparently belong to a species with tomentum on the underside of the leaves.

759. ***Cirsium kamtschaticum*** Ledeb. ex DC., Prodr. VI (1837) p. 644 (*Kamtschaticum*).

Ledeb., Fl. Ross. II p. 736; Herder, Pl. Radd. Monopet. No. 197 in Bull. Mosc. 43: 1 (1870) p. 84 et Radde, Reisen III: 4 p. 4 (α *genuinum*); Yabe & Yendo, Fl. Shimshu p. (198); Fedtsch., Fl. Îl. Comm. p. 78 (var. *alatum* Trautv.); Kudo, Fl. Paramush. p. 172 (f. *elatius*). — »*Cirsium capitulis in vertice congestis . . .*» Gmel., Fl. Sib. II p. 62. — »*Cirsium* Gm. Sib. II 69 No. 49» Pennant, Arct. Zool. (1784) p. CXVI. — ». . . ein grosses *Cirsium*» Mertens, Bemerk. Fl. Koragins p. 63. — *Cnicus oleraceus* Erman, Verzeichn. p. 57. — *Cirsium oleraceum* Ledeb., Fl. Ross. II p. 738 quoad pl. Kamtsch. — *Cnicus kamtschaticus* Maxim. in Mél. Biol. IX (1886) p. 310 (α *genuinus*); Miyabe. Fl. Kuril. p. 244.

Northern Kuriles: Paramushir C. Taro 1892 acc. to Kudo loc. cit., Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Cape Lopatka collected by cosacks, do. W. coast June 24th 1920 Hn No. 149; Kurile Lake noted by Hn; N.W. of Kurile Lake noted in A. 210, A. 211; N. of Kurile Lake noted in A. 208; lower Ozernaja R. 10 km. from the village Aug. 12th 1921 Hn No. 2815, do. noted in A. 96, A. 100; N. of Illina volcano noted by Hn; between Javina and Kochegochek noted in A. 91, A. 92; upper Unkanakchek R. noted in A. 196, A. 197; S. of Kochegochek noted by Hn; Sahach noted in meadow by Hn; the junction of Ksudach and Golygina rivers noted in A. 89, A. 90; middle Kusingen R. noted in A. 194; upper Kusingen R. noted in A. 190; S. of Golygina noted by Hn; Golygina noted by Hn; upper Ksudach R. noted in A. 83, A. 84; middle Ksudach R. noted in A. 86; between the mouths of Golygina and Opala rivers in »subalpine» meadow noted by Hn; W. Shadutka R. noted by Hn; Lake Sterbot noted in A. 215; between Lake Sterbot and Lake Kambolnoje in »subalpine» meadow noted by Hn; upper Savan R. noted in A. 79, A. 80; middle Assatcha R. Aug. 11th 1922 Hn No. 4225; N.W. slope of Assatcha mts. noted in A. 177, A. 178; upper Opala R. near Assatcha noted in A. 180,

A. 183, A. 184, A. 185; S. of Zykovaja noted in A. 217; upper Udoshk R. noted in A. 78 b; the hot springs at upper Opala R. noted in A. 182; Akhomten Bay Aug. 30th 1920 Hn No. 1170 (Malaise), do. 250 m. Sept. 9th 1920 Hn No. 1197, do. noted in A. 26, A. 27, A. 28, A. 31, A. 35; Opala volcano noted in A. 73, A. 77, A. 78 a; N.W. of Opala volcano noted in A. 66, A. 67; upper Abshen R. noted by Hn; lower Bolshaja R. noted in A. 107; the mouth of Balaganchik R. noted in A. 153; middle Karymchina R. noted in A. 57; lower Karymchina R. noted in A. 124, A. 151; Agashka R. noted in A. 62, A. 63, A. 64, A. 65; Danilina R. noted in A. 61; the Kohelok Pass noted in A. 125; lower Bolshaja R. noted in A. 105; Bolsheredsk Vossnesensky 1847; between Bolsheredsk and Apatcha noted in A. 113; lower Bannaja R. noted by Hn; the hot springs at Siku R. noted in A. 122; upper (Paratunka-) Bystraja R. noted in A. 128; Paratunka Stubendorff; »Perishejk» Tarja Bay Perfiljef 1910; mt. Zerkalo, Natchika Komarov 1908, do. noted in A. 114, A. 115, A. 118, A. 119; Savoiko July 15th 1928 W. Eyerdam, do. Aug. 24th 1928 Malaise; between Savoiko and Korjaka Komarov 1908; the mouth of Gorelaja R. in Korjaka R. Komarov 1908; the Korjaka valley Komarov 1908 (Hb. Berol.).

East Kamtchatka: Petropavlovsk Vossnesensky 1846, do. Dobrotvorsky 1881, do. Bezais 1908, do. noted in A. 129 a, A. 129 b, A. 130, do Aug. 16th 1920 Hn No. 880; Kalashtyrka Perfiljef 1910; between Petropavlovsk and Avatcha volcano noted in A. 7, A. 9, A. 17, A. 18, A. 24 a, A. 42; Avatcha volcano 675 m. July 31st 1920 Hn No. 680; Kichpinitch volcano Komarov 1909; Mt. Krasheninnikoff Komarov 1909; E. slope of Klutchevskaja volcano 3000 feet Bezais 1909 (Hb. Berol.), do. N. slope Protopopof 1909; Lake Assabatche Aug. 15th 1925 Malaise No. 563; Shivelutch acc. to Erman loc. cit.

Commander Islands: Bering Island Vossnesensky 1847, Kjellman, Dybovsky 1879, Grebnitzky 1891, Stejneger acc. to Fedtsch. loc. cit., Protopopof 1909; Copper Island Dybovsky 1879.

Central Kamtchatka: Ganala Stewart, W. Shtchapina R. Komarov 1909; the hot spring »Kipploje» Komarov 1909; Anauna R. Sept. 5th 1926 Malaise No. 304; 5 verst above Klutchi Bezais 1908; the southern slope of Tchuchovka mts. Bezais 1908.

West and North Kamtchatka: Utka Rubinski 1908; Tigil Levitzky 1848, do. Gudzenko 1910; Karaginsk Island acc. to Mertens loc. cit.

»Kamtchatka»: Steller (Hb. Pallas), »*Cirsium Stelleri* mihi Gmel. fl. sib. II tab. 24» (Hb. Berol.), Langsdorff, Rastargujeff, Stewart, Kastalsky (Hb. Berol.), Kusmischeff, Mertens, Rieder.

Noted in the following associations:

In *Alnus hirsuta—Filipendula—Dryopteris* ass.:

Single (A. 65, A. 194).

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 67, A. 79, A. 83, A. 84, A. 86, A. 92, A. 100, A. 105, A. 153, A. 182, A. 190); Sparse (A. 66, A. 78 b, A. 91, A. 107, A. 114, A. 119, A. 184, A. 185); Scattered (A. 96).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 61, A. 113, A. 122, A. 124, A. 151).

In *Betula Ermani—Filipendula—Dryopteris* ass.:
Single (A. 24 a, A. 62, A. 197); Sparse (A. 63, A. 64, A. 115, A. 180, A. 196).

In *Betula Ermani—Filipendula—Equisetum hiemale* ass.:
Single (A. 57, A. 90); Sparse (A. 89).

In *Betula Ermani—Thalictrum—Carex* ass.:
Single (A. 7, A. 9, A. 17, A. 18, A. 42): Sparse (A. 183).

In *Epilobium angustifolium—Geranium—Majanthemum* ass.:
Single (A. 217); Sparse (A. 215).

In *Alnus—Glyceria—Athyrium* ass.:
Single (A. 28, A. 35); Sparse (A. 27).

In *Alnus—Calamagrostis—Dryopteris* ass.:
Single (A. 129 a, A. 129 b, A. 130).

In *Alnus—Calamagrostis—Veratrum* ass.:
Sparse (A. 178).

In *Artemisia arctica—Solidago—Viola Langsdorffii* ass.:
Single (A. 118, A. 211); Sparse (A. 77, A. 78 a, A. 125); Scattered (A. 210).

In *Artemisia arctica—Solidago—Salix »arctica»* ass.:
Single (A. 26, A. 80, A. 128); Sparse (A. 73, A. 177, A. 208); Scattered (A. 31).

C. kamtschaticum is a very common plant in South Kamtchatka, where it occurs very constantly in all kinds of meadows from the sea-level to the lower alpine region. It is also common in the *Betula Ermani* forests, and occurs, although more scattered, in the *Alnus* belt both in the *Alnus* thickets and in the open meadow-like spots between them. It flowers from the middle of July to September. The flowers are purplish, not, as is often stated in literature, white.

C. kamtschaticum varies somewhat in the form of the leaves, the size and position of the spines and the length of the decurrent part of the leaves, but on the whole it is a very distinct type. In some of the specimens the lobes of the leaves are entire, but in others they are provided with scattered, large teeth, or even once more lobated. The upper leaves are sometimes comparatively narrow, but specimens also occur with broadly ovate upper leaves. The lower leaves are more or less decurrent. The flowers are usually more or less nodding during the anthesis.

Type of distribution: Asiatic Pacific.

Geographical area: Kamtchatka, Commander Islands, the Kuriles, E. Yezo.

Also reported by Asa Gray from Atcha, one of the Aleutian islands. In Japan closely related species.

Leontodon autumnale L., Sp. pl. ed. I (1753) p. 798.

East Kamtchatka: »Majak» (= the lighthouse) Perfiljef 1911.

This species occurred occasionally introduced into our area. A native of Europe and western Siberia, introduced and partly naturalized in N. Amer. and in southern Greenland.

760. ***Picris hieracioides*** L., Sp. pl. ed. I (1753) p. 792 (*Hieracioides*).

subsp. ***kamtschatica*** (Ledeb.) nov. comb.

»*Picris calicibus imbricatis . . .*» Gmel., Fl. Sib. II p. 39 quoad pl. Kamtsch. — *Picris hieracioides* Pennant, Arct. Zool. (1784) p. CXVI; Georgi, Beschreib. III: 5 p. 1206. — *Picris Kamtschatica* Ledeb. in Mém. Ac. Imp. Sc. St. Petersb. V (1815) p. 557; Ledeb., Fl. Altaica IV p. 159. — *Picris hieracioides* var. *japonica* Herder, Pl. Radd. Monopet. No. 218 in Bull. Mosc. 43: 1 (1870) p. 105 et Radde, Reisen III: 4 p. 25 (saltem quoad pl. Kamtsch.); Yabe & Yendo, Fl. Shimushu p. (196); Fedtsch., Fl. Îl. Comm. p. 79. — *Picris japonica* Ledeb., Fl. Ross. II p. 800 saltem quoad pl. Kamtsch.; Kudo, Fl. Paramush. p. 173 quoad pl. Kuril.; Kom. in herb.

Northern Kuriles: Paramushir C. Taro 1892 and S. Yokoyama 1893 both acc. to Kudo loc. cit., Kudo 1920; Shumshu acc. to Yabe & Yendo loc. cit.

South Kamtchatka: Kurile Lake noted in meadow by Hn; lower Ozernaja R. noted in A. 100; the hot springs at upper Unkanakchek R. Aug. 19th 1922 Hn No. 4320; upper Ksudach R. noted in A. 83; W. Shadutka R. noted in meadow by Hn; between the mouths of Golygina and Opala rivers in »subalpine» meadow noted by Hn; the hot springs at Savan R. 110 m. July 31st 1921 Hn No. 2519; Assatcha mts. 300 m. Aug. 9th 1922 Hn No. 4182; upper Udoshk R. 250 m. July 25th 1921 Hn No. 2418; lower Bolshaja R. noted in A. 105; the mouth of Balaganchik R. noted in A. 152, A. 154; middle Karymchina R. noted in *Angelica ursina* meadow by Hn; the hot springs at upper Karymchina on hot gravel noted by Hn; Bolsheredsk July 8th 1921 Hn No. 2031; between Bolsheredsk and Apatcha noted in A. 113; the hot springs at Siku R. noted in A. 122; lower Bannaja R. in *Angelica ursina* meadow noted by Hn; the hot spring »Malenki klutchik» Bannaja on hot gravel noted by Hn; the hot springs at upper Bannaja R. noted by Hn; the hot springs at »Gorelaja Gora», upper Paratunka R. Komarov 1908; Paratunka Stubendorff; Lake Dalni Komarov 1908; mt. Zerkalo, Natchika Komarov 1908 (Hb Holm.), do. noted in A. 114; Savoiko July 14th 1928 W. Eyerdam, do. July 28th 1928 Malaise.

East Kamtchatka: »Majak» (= the lighthouse) Perfiljef 1911; Petropavlovsk July 21st 1920 Hn No. 526, do. 165 m. Aug. 18th 1920 Hn No. 976, do. July 23rd 1928 W. Eyerdam; Kalashtyrka Perfiljef 1910; between Petro-

pavlovsk and Avatcha volcano noted in A. 7; Avatcha volcano 800 m. July 31st 1920 Hn No. 668.

Commander Islands: Bering Island Stejneger and Morozevicz acc. to Fedtsch. loc. cit.

Central Kamtchatka: Malka Protopopof 1908; Ganala Stewart; the hot spring »Kipploje» Komarov 1909; Anauna R. Sept. 2nd 1926 Malaise No. 324; Klutchi Bezais 1908 (Hb. Berol.).

West and North Kamtchatka: Kishtchik Rubinski 1908; Krutugorovaja Zelenin 1908; Tigil Levitzky 1848; Pallan Savtchenko 1911.

»Kamtchatka»: »ded. am. Tilesius Petrop. 13» (sub »*P. camtschatica* mihi»); Langsdorff (sub »*tenax* Wormsk.»), Kastalsky (Hb. Berol.), Kusmischeff, Mertens, Peters 1831, Rieder 1831.

Noted in the following associations:

In *Thalictrum—Sanguisorba—Carex* ass.:
Single (A. 83, A. 100, A. 105, A. 114).

In *Angelica ursina—Filipendula—Thalictrum* ass.:
Single (A. 113, A. 122).

In *Betula platyphylla—Thalictrum—Carex* ass.:
Single (A. 152, A. 154).

This plant is comparatively common in the lowland meadows of South Kamtchatka. It occurs also in the »subalpine» meadows along the western coast (the *Epilobium angustifolium—Geranium—Majanthemum* ass.). It flowers from the beginning of July to September. Specimens from eastern Siberia, especially those from Kamtchatka, differ considerably from the Scandinavian plant of this type. The stem is strongly setose with glochidiate bristles, the heads are large, usually having only slight traces of a tomentum on the scales, and the upper part of the peduncles is considerably thickened, the involucral scales are long and narrow and strongly setose, the setae often being broad and flattened at the base and of a greenish-black colour, while the achenes are of a bright brownish-red colour, long and narrow, with slightly less marked sculpture than those of the European plant. The Kamtchatka plant has usually been referred to *P. japonica* Thunb., but Japanese specimens differ in their more gracile growth, smaller heads on peduncles not thickened in their upper part, stem with sparser glochidiate bristles and fewer bristles on the involucral scales. The type specimen of *P. japonica* in Hb. Thunberg (Uppsala), which I have seen, differs in the same way from the Kamtchatka plant which, however, is certainly more closely allied to the Japanese plant than to the European and might possibly be regarded as a separate species. As *P. hieracioides* even in Europe occurs in several forms (5 subspecies acc. to Gams in Hegi, Ill. Fl. Mitt. Europ.), and as practically the same characteristics are subject to variation there as those distinguishing our plant from the head-form, and as, finally, the line of demarcation between the two forms in Siberia

seems to be very unclear, I regard it here as a subspecies of the collective species *P. hieracioides*.

Type of distribution: Eurasiatic; subsp. *kamtschatica:* Eastern Asiatic.

Geographical area: In several subspecies: Europe: from England, southern Sweden, central Finland, Vologda and Perm provinces, southwards to northern Spain, Italy, Crimea and Caucasus. Asia: at Yenisei reported as far northwards as to about 68° N. lat., from Irkutsk prov., Transbaikalia, Saghalin and Kamtchatka, southwards to northern Persia, the Himalayas, northern China and southern Japan, introduced into India, N. Amer., Australia, New Zealand and elswere. Subsp. *kamtschatica* in eastern Siberia and Kamtchatka.

Taraxacum.

The genus *Taraxacum* in Kamtchatka has already been dealt with by Dahlstedt (Sv. Vet. Akad., Ark. f. Bot. 20 A (1925) No. 1). The number of forms proved to be comparatively large and the need for obtaining a more comprehensive material was evident. At my request, special attention was paid to the genus by Malaise and other later collectors, with the result that no less than 7 new species can be described and figured here. It has also been possible to add several new localities to the earlier ones. The description of the species was kindly undertaken by Dr. H. Dahlstedt, who has also furnished the critical notes.

The genus *Taraxacum* cannot by any means be said to be represented by a large number of individuals in the uninhabited part of the Kamtchatka peninsula. The only species that is comparatively common there is *T. kamtschaticum*, while the others are more or less scattered. Specimens of *Taraxacum* are more frequently found in the villages, but our present knowledge on the subject cannot give us any idea of the distribution of the respective species. Apparently there are still a comparatively large number of species within the area that have not been described.

It is useless to attempt to divide earlier reports of *Taraxacum* species into the respective species, as *T. officinale* was formerly regarded as a collective species including most of them. For the sake of completeness earlier reports of *Taraxacum* forms from our area are quoted below.

»*Leontodon calice inferne reflexo . . .*» Gmel., Fl. Sib. II p. 14. — *Leontodon Taraxacum* Georgi, Beschreib. III: 5 p. 1209; Mertens, Bemerk. Fl. Koragins p. 65; Hook. & Arnott in Bechy's Voy. p. 115. — *Leontodon palustre* Less. in Linnaea VI (1831) p. 101. — *Taraxacum ceratophorum* DC., Prodr. VII p. 146; Ledeb., Fl. Ross. II p. 813; Kudo, Fl. Paramush. p. 174. — *Taraxacum officinale* Ledeb., Fl. Ross. II p. 812; Yabe & Yendo, Fl. Shimushu p. (195). — *Taraxacum palustre* Ledeb., Fl. Ross. II p. 815. — *Taraxacum officinale* β *glaucescens* b. *ceratophorum* Herder, Pl. Radd. Monopet. No. 226 in Bull. Mosc. 43: 1 (1870) p. 113 et Radde, Reisen III: 4 p. 33. — *Taraxacum officinale* var. *ceratophorum* et var. *lividum* Fedtsch., Fl. Îl. Comm. pp. 79, 80. — *Taraxacum Mongolicum* Hand.-Mazz., Monogr. Tarax. p. 67.

761. ***Taraxacum acricorne*** DAHLST. n. sp.; fig. 11.

Planta humilis. Folia plurima anguste lineari-lanceolata v. linearia, lobis brevibus deltoideis angustis apicibus ± patentibus acutis ± integris, interlobiis angustis plerumque sejunctis, lobo terminali parvo ± triangulari acuto, interiora et intima latiora ± obovato-lanceolata acuta dentibus lobulisque brevibus praedita, lobo terminali sat magno acuto subintegro petiolis leviter roseo-coloratis v. pallidis; nervo mediano pallido. Involucrum olivaceo-viride mediocre, basi ovata. Squamae exteriores anguste ovato-lanceolatae—lanceolatae ± laxe adpressae infra apicem cornu brevi angusto ± acuto atropurpureo praeditae, interiores breve corniculatae-callosae v. singulae ecallosae. Calathium c. 35 mm diametro. Ligulae amoene luteae, marginales extus striis coloratis secus nervos notatae. Antherae pollinifere. Stylus et stigmata fusco-virescentes. Achenium ignotium.

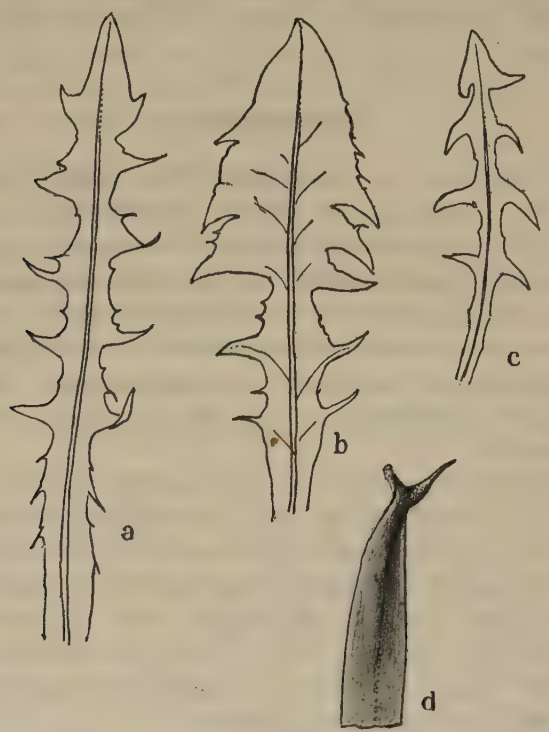


Fig. 11. *Taraxacum acricorne.* a, b, c natural size; d enlarged four times.

East Kamtchatka: Petropavlovsk, the »Signal hill» June 25th 1928 W. EYERDAM (Hb. Holm.).

The leaves of this species resemble those of *T. leptoceras* DAHLST. having narrow acute appendages to the outer phyllaries, larger heads, polleniferous anthers and lack of spots on the leaves. It differs from *T. dilutum* DAHLST. in the form of the leaves, in their darker colour, in having larger heads, and in the presence of pollen. It belongs to the *Ceratophora*.

Type of distribution: ?
Geographical area: Known from the type-locality only.

762. ***Taraxacum albescens*** DAHLST. in Sv. Vet. Akad., Ark. f. Bot. 20 A No. 1 (1925) p. 14 fig. 9.

Central Kamtchatka: Mt. »Ganalski Vystraki» July 18th 1924 P. T. NOVOGRABLENOF (Hb. Holm.).

Type of distribution: ?
Geographical area: Known from the type-locality only.

763. ***Taraxacum dilutum*** DAHLST. in Sv. Vet. Akad., Ark. f. Bot. 20 A No. 1 (1925) p. 4, fig. 2.

South Kamtchatka: Nikolajevsk July 11th 1908 KOMAROV (Hb. Holm.).

Central Kamtchatka: Klutchi June 18th 1921 HN No. 3358 (MALAISE).

Type of distribution: ?
Geographical area: Known from Kamtchatka only.

764. ***Taraxacum evittatum*** DAHLST. nov. spec.; fig. 12.

Folia laete viridia, exteriora ± lingulata—lineari-lanceolata, sparse et breve lobata lobis triangularibus acutis praedita v. in speciminibus cultis integra lingulata—ovalia sparse et breve dentata, intermedia et interiora ± lanceolata anguste lobata—lobulato-dentata, lobis et dentibus ± acutis v. in spec. cultis subintegra lanceolato-obovata—lanceolata dentibus magnis acutis patentibus v. leviter recurvatis, glabra—subglabra, petiolis et nervo dorsali in inferiore parte leviter violascentibus. Scapi plures, quam folia longiores saepe ± obscure colorati v. in spec. cultis pallidi, glabri—subglabri v. apice ipso ± araneoso-pilosi. Involucrum olivaceo- v. atro-viride basi initio ± turbinata deinde ± ovata. Squamae exteriores anguste ovato-lanceolatae—lanceolatae ± adpressae inconspicue marginatae sub apice cornibus brevibus obscuris praeditae, interiores brevius et angustius corniculatae. Calathium magnum radians, 50—55 mm diametro. Ligulae sat laete luteae, marginales extus evittatae v. stria pallide cano-violacea et parum conspicua notatae, planae. Antherae polliniferae. Stylus et stigmata magna ± fuscovirescentes. Achenium fusco-stramineum, 3,5 mm longum, ad 1 mm latum, apice spinulosum caeterum fere ad basin ± tuberculatum, in pyramidum vix 1 mm longam conicam abiens, rostro 15 mm. longo.

East Kamtchatka: Petropavlovsk at La Perouse-monument June 16th 1928 W. EYERDAM (Hb. Holm.).

»Kamtchatka»: Grown up in Stockholm from seeds collected in Kamtchatka by MALAISE.

Belongs to the *Ceratophora*. It is very easily distinguished by means of its pale yellow, radiant and wide calathia and the marginal flowers, which are unstriped or only faintly striped underneath. In spontaneous specimens the

outer phyllaries are more narrowly lanceolate, in cultivated specimens they are more or less narrow ovate. The leaves vary from lanceolate short-lobed in spontaneous specimens to more or less broad lanceolate to obovate lanceolate and entire with larger and elongated small teeth in cultivated specimens.

Type of distribution: ?

Geographical area: Known from Kamtchatka only.

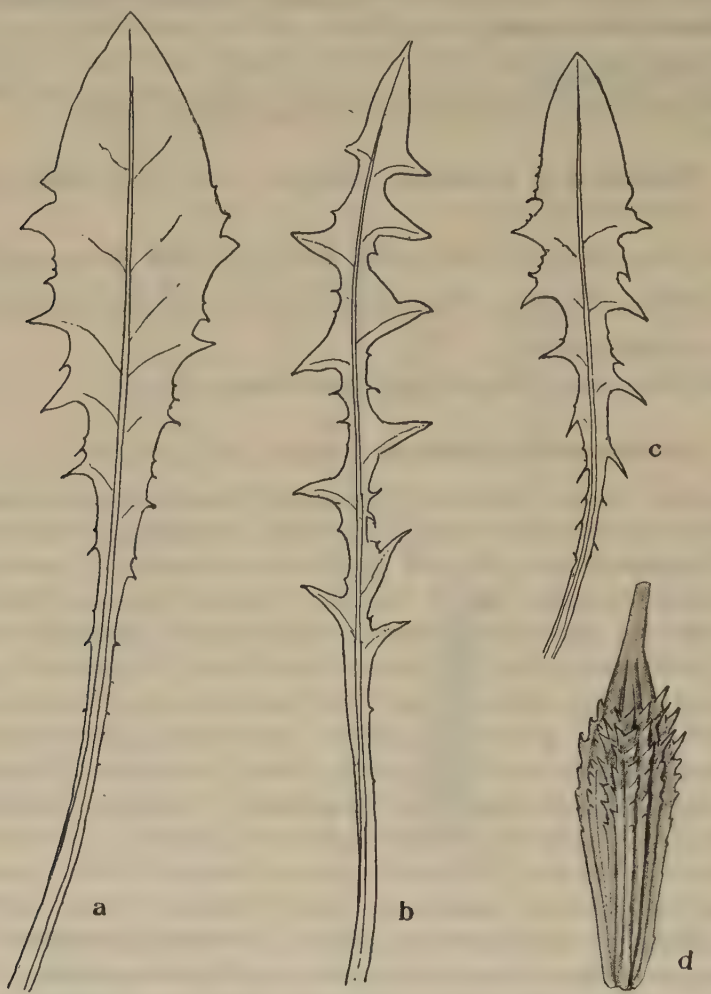


Fig. 12. *Taraxacum evittatum.* a leaf from a cultivated specimen; b, c leaves from wild specimens; d fruit; a—c natural size; d enlarged ten times.

765. ***Taraxacum Hultenii*** Dahlst. in Sv. Vet. Akad., Ark. f. Bot. 20 A No. 1 (1925) p. 11 fig. 7.

South Kamtchatka: Savoiko July 7th 1920 Hn No. 266, do. July 9th 1920 Hn No. 355 a.

Type of distribution: ?

Geographical area: Known from the type-locality only.

766. ***Taraxacum kamtschaticum*** DAHLST. in Sv. Vet. Akad., Ark. f. Bot. 20 A No. 1 (1925) p. 2, fig. 1.

?*Taraxacum officinale* γ *alpinum e lyratum* HERDER, Pl. Radd. Monopet. No. 230 in Bull. Mosc. 43: 1 (1870) p. 123 et RADDE, Reisen III: 4 p. 43. — ?*Taraxacum lyratum* HANDEL-MAZZ., Monogr. Tarax. p. 57.

South Kamtchatka: Ozernaja BEZAIS 1908; Golygina village Aug. 8th 1921 HN No. 2748; Topik 580 m. July 28th 1921 HN No. 2467; Lake Tolmachovaja 600 m. July 12th 1922 HN No. 3894; S. of Bolsheredsk July 13th 1921 HN No. 2124; Bolsheredsk June 13th 1922 HN No. 3794; Apatcha June 19th 1922 HN No. 3819; Bannaja R. RUBINSKI 1909; mt. Tshapochka, Natchika KOMAROV 1908.

East Kamtchatka: Petropavlovsk KOMAROV 1908; the »Penshivo pass» July 28th 1928 W. EYERDAM; Lake Kronoki Sept. 22nd 1921 HN No. 3610 a and b (MALAISE).

Central Kamtchatka: Anauna R. Aug. 18th 1926 MALAISE No. 316, do. Aug. 19th 1926 MALAISE No. 315, do. Sept. 5th 1926 MALAISE Nos. 306, 307 and 308, do. Sept. 15th 1926 MALAISE No. 309.

T. kamtschaticum, which is a very characteristic plant, is not rare in South Kamtchatka, where it is the only *Taraxacum* species that occurs fairly commonly in the mountains.

Type of distribution: ?

Geographical area: So far known only from our area.

767. ***Taraxacum latisquameum*** DAHLST. in Sv. Vet. Akad., Ark. f. Bot. 20 A No. 1 (1925) p. 9 fig. 6.

South Kamtchatka: Mutnovskaja volcano 1400 m. July 29th 1922 HN No. 4054.

Central Kamtchatka: Malka July 27th 1924 P. T. NOVOGRABLENOF (Hb. Holm.).

Type of distribution: ?

Geographical area: Known only from Kamtchatka.

768. ***Taraxacum leptoceras*** DAHLST. in Sv. Vet. Akad., Ark. f. Bot. 20 A No. 1 (1925) p. 5 fig. 3.

South Kamtchatka: Savoiko June 12th 1928 MALAISE.

East Kamtchatka: Petropavlovsk KOMAROV 1908, do. June 1st 1921 HN No. 1610, do. June 1928 MALAISE.

Type of distribution: ?

Geographical area: Known only from Kamtchatka.

769. ***Taraxacum Malaisei*** DAHLST n. sp.; fig. 13.

Folia laete gramineo-viridia, exteriora ± anguste lanceolata breve triangulari-lobata, lobis integris v. inferioribus in superiore margine denticulatis,



Fig. 13. *Taraxacum Malaisei*. a half natural size; b enlarged ten times.

lobo terminali parum limitato, triangulari acuto, lobulis lateralibus brevibus patentibus acutis, interiora ± integra—subintegra lobulis in margine superiore denticulatis v. dentibus magnis minoribus intermixtis ± patentibus v. superne leviter curvatis praedita, omnia glabra v. praesertim in nervo dorsali pilosula, petiolis et nervo mediano p. max. p. ± vivide violascentibus. Scapi plures, quam folia longiores apice leviter pilosuli. Involucrum ± atro-viride, sat angustum basi ± ovato-turbinata. Squamae exteriores adpressae, late ovatae acuminatae, acumine et proxima parte marginis ± violascente, ± albo-marginatae, sub apice cornu v. corniculo obscuro v. piceo praeditae, interiores sub apice piceo v. obscuro ± corniculatae. Calathium 40—50 mm diametro, sat plenum. Ligulae sat obscure luteae, marginales extus stria cano-violacea notatae, subcanaliculatae. Antherae ut videtur vacuae. Stylus obscurus. Achenium 3,5 mm longum, ad 1 mm latum, apice acute spinulosum, caeterum p. max. p. laeve, in pyramidem c. 1 mm longam anguste conicam sensim abiens, rostro 10 mm longo.

Cultivated in Stockholm from seeds collected in Kamtchatka by Malaise. Wild specimens not known.

Belongs to the *Ceratophora*. Very characteristic on account of the narrow dark heads with adpressed, broad ovate outer phyllaries with dark black-purplish, short appendages under the apex, and entire, more or less obovate lanceolate leaves with larger and smaller intermixed acute teeth.

770. ***Taraxacum perlatescens*** Dahlst. in Sv. Vet. Akad., Ark. f. Bot. 20 A No. 1 (1925) p. 13 fig. 8.

South Kamtchatka: Bogatyrjovka July 16th 1920 Hn No. 443; Savoiko July 3rd 1920 Hn No. 355 b, do. July 17th 1928 Malaise, do. July 29th 1928 W. Eyerdam.

East Kamtchatka: Petropavlovsk July 10th 1928 W. Eyerdam.

Type of distribution: ?

Geographical area: Known only from Kamtchatka.

771. ***Taraxacum platyceras*** Dahlst. in Sv. Vet. Akad., Ark. f. Bot. 20 A No. 1 (1925) p. 6 fig. 4.

South Kamtchatka: Kurile Lake Aug. 27th 1922 Hn No. 4418; Savoiko June 10th 1928 Malaise.

Type of distribution: ?

Geographical area: Known only from Kamtchatka.

772. ***Taraxacum platycranum*** Dahlst. n. sp.; fig. 14, 15.

Folia plurima lanceolata—anguste obovato-lanceolata, lobis crebris deltoideis ± retroversis et ± acutis apicibus mediocribus retroversis—leviter patentibus dorso ± convexo, superioribus integris, inferioribus ± dentatis, lobo terminali in fol. ext. parvo triangulari integro, in fol. int. majore ± dentato parum limitato, interiora ± integra ± late obovata late et breve dentata. Scapi folia superantes leviter colorati subglabri v. parce sub involucro ± dense araneosi. Involucrum ± obscure olivaceo-viride humile crassum latum basi ± truncata. Squamae exteriores sat adpressae late—latissime ovatae—late ovato-lanceolatae sat dilutae apicem versus et in marginibus superioribus saepe roseo-coloratae,



Fig. 14. *Taraxacum platycranum.* Natural size.

sub apice cornubus brevibus obtusis ± obscure purpurascentibus praeditae v. superiores ecorniculatae, interiores ecorniculatae v. singulae brevissime corniculatae. Calathium amoene luteum 40—45 mm diametro, plenum. Ligulae planae marginales extus secus nervos striatae. Antherae vacuae. Stylus et stigmata lutea v. lutescentia. Achenium ignotum.

East Kamtchatka: Petropavlovsk »in marshy tundra» June 20th 1928 W. Eyerdam.

This species is very easily recognized on account of its broad and thick heads with broad adpressed outer phyllaries and their large blunt appendages. It belongs to the group *Ceratophora* but the shape of the heads is very reminiscent of such forms as *T. platycarpum* and allied Japanese species.

Type of distribution: ?

Geographical area: Known from the type-locality only.

773. ***Taraxacum pseudoglabrum*** Dahlst. n. sp.; fig. 16.

Folia laete viridia, lingulata—spathulata, exteriora lobulis brevissimis late triangularibus, intermedia lobis latis brevibus deltoideis (subhamatis) integris et inferioribus interdum ± denticulatis praedita v. folia fere omnia integerrima, intermedia obtuse undulata, petiolis pallidis v. leviter violascentibus saepe ± alatis. Scapus folia longe superans basi apiceque cupreo-coloratus subglaber—leviter pilosulus. Involucrum breve crassiusculum mediocre ± atroviride

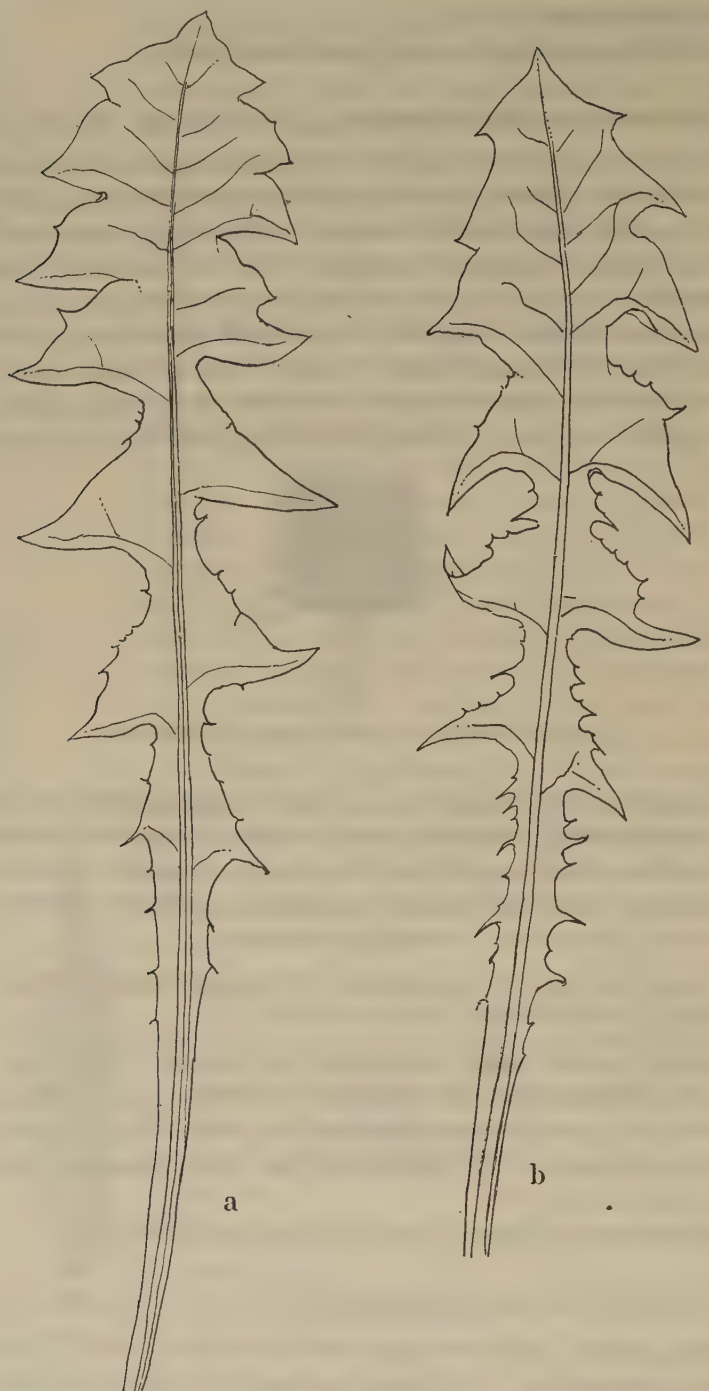


Fig. 15. *Taraxacum platycranum.* Natural size.

basi ± ovato-truncata. Squamae exteriores breves latius—angustius ovatae longe acuminatae acumine obtuso saepe obscuro v. leviter violascente adpresse anguste

(saepe vix conspicue) marginatae, interiores latiusculae ± obtusae. Calathium parvum c. 35 mm latum parum radians. Ligulae ut videtur laete luteae, marginales subtus exstriatae v. stria pallide cano-violacea notatae. Antherae parce polliniferae. Stylus et stigmata fusco-virescentia sicca fere atra. Achenium ± rubiginosum, 4 mm longum 1 mm latum v. paulo latius, apice parce et acute spinulosum, caeterum tuberculatum, in pyramidem 0,75 mm longam late conicam sensim abiens, rostro 10 mm longo.

East Kamtchatka: Klutchevskaja volcano Aug. 6th 1927 MALAISE.

Central Kamtchatka: Ánauna R. »also high up in the mts.» Sept. 5th 1926 MALAISE No. 305.

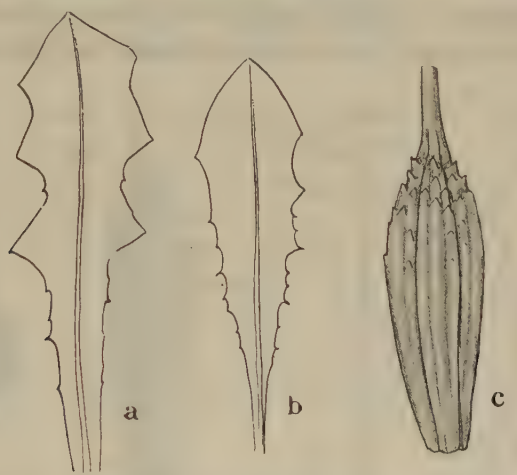


Fig. 16. *Taraxacum pseudoglabrum* (MALAISE No. 305).
a, b natural size; c enlarged ten times.

It is very uncertain to which group this species should be referred. Perhaps it may belong to *Glabra* or be in the neighbourhood of that group. In the shape of the heads and outer phyllaries it bears a very great resemblance to *T. glabrum*, but it differs in its leaves and the larger and more or less spinulous and tuberculate fruits. As regards the leaves, it varies very highly from quite entire to more or less short-lobed. The former kind seems to be met with in shady or wet places, the latter in more dry and open localities.

Type of distribution: ?

Geographical area: Known only from Kamtchatka.

774. ***Taraxacum rubiginans*** DAHLST. n. sp.; fig. 17.

Folia lingulata—obovato-lanceolata laete viridia glabra exteriora v. omnia breve lobata interiora lobis triangularibus—deltoideis sat brevibus ± approximatis integris—subintegris v. inferioribus ± dentatis praedita, lobo terminali parvo latiuscule triangulari v. subsagittato, interiora ± lobulata et dentata v. subintegra denticulata apice ± lato integro, petiolis et nervo dorsali pallidis. Scapi folia superantes basi apiceque ± colorati. Involucrum mediocre latiusculum ±

atroviride basi ovata. Squamae exteriores breves ± late ovatae sat longe—longe acuminatae acumine angusto obtusiusculo—obtuso, adpressae, inconspicue marginatae, interiores latiusculae e basi lata lineares ± obtusae apice leviter coloratae omnes ecorniculatae. Calathium parvum c. 30 mm. diametro sat plenum. Ligulae subobscure luteae marginales extus fere evittatae v. striis cano-violaceis notatae. Antherae polline carentes. Stylus et stigmata atrovirescentia sat longe excedentia. Achenium rufescens fere 4 mm longum 1 mm latum, apice breve spinulosum inferne ± tuberculatum, pyramide 0,75 mm longa late conica, rostro c. 9 mm longo.

Central Kamtchatka: Anauna R. Aug. 19th 1926 Malaise No. 314.

It is very uncertain to which group this species ought to be referred. It resembles the *Erythrosperma* in the reddish fruits, but differs from the species

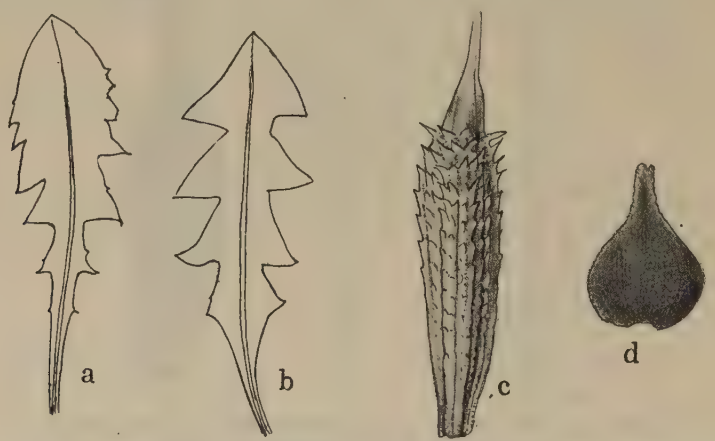


Fig. 17. *Taraxacum rubiginans.* a, b natural size; c enlarged ten times; d enlarged four times.

of that group in its entire lack of appendages on the phyllaries and in the fruit's short conic beak.

Type of distribution: ?

Geographical area: Known from the type-locality only.

775. ***Taraxacum rufum*** Dahlst. n. sp.; fig. 18.

Folia ut videtur laete viridia glabra—subglabra lingulata—lineari-lanceolata, multiloba lobis approximatis brevibus triangularibus v. vulgo deltoideis subhamatis acutis, inferioribus ± denticulatis, superioribus integris—subintegris, lobo terminali parvo (sagittato-) triangulari lobulo mediano ± elongato acutiuscula, lobulis lateralibus brevibus patentibus acutis. Scapi plures folia aequantes inferne glabri superne ± araneoso-pilosi. Involucrum parvum olivaceo-viride basi ± rotundata. Squamae exteriores late ovato-lanceolate sat longae adpressae infra apicem cornutae, interiores sub apice breve cornutae—corniculatae. Calathium ignotum. Achenium ± obscure rufum apice breve spinulosum caeterum usque ad basin tuberculatum, 4 mm longum, 1 mm latum,

in pyramidem c. 1 mm longam anguste cylindricam abrupte abiens; rostro 8—9 mm longo.

Central Kamtchatka: Korjatskaja volcano Aug. 14th 1928 W. EYERDAM.

Probably this species belongs to *Erythrosperma*, as is apparently shown by the configuration of the leaves and in some degree also by the colour and form of the fruit.

Type of distribution: ?

Geographical area: Known from the type-locality only.

776. ***Taraxacum trigonolobum*** DAHLST. in Sv. Vet. Akad., Ark. f. Bot. 20 A No. 1 (1925) p. 8 fig. 5; *Taraxacum ceratopholum* HAND.-MAZZ. Monogr. Tarax. p. 62.

South Kamtchatka: Mutnaja Bay RIEDER 1831; Lake Blishne KOMAROV 1908; Grishkinoj R., Lake Natchika KOMAROV 1908; mt. Tshapotcha, Natchika KOMAROV 1908; Savoiko June 10th 1928 MALAISE; Korjaka KOMAROV 1908; Avatcha Bay July 1886 REINER KESSLITZ (Hofmuseum, Wien).

East Kamtchatka: Avatcha volcano 675 m. July 30th 1920 HN No. 610; the hot springs at Nalutcheva July 30th 1928 W. EYERDAM; mt. Krasheninnikoff KOMAROV 1909.

Type of distribution: ?

Geographical area: Known only from Kamtchatka.

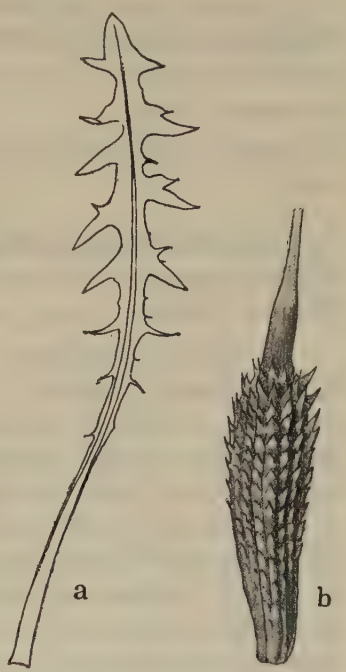


Fig. 18. *Taraxacum rufum*, a natural size; b enlarged ten times.

777. ***Mulgedium sibiricum*** (L.) LESSING, Synops. Compos. (1832) p. 142.

LEDEB., Fl. Ross. II p. 843; HERDER, Pl. Radd. Monopet. No. 259 in Bull. Mosc. 43: 1 (1870) p. 216 et RADDE, Reisen III: 4 p. 72. — »*Sonchus foliis lanceolatis, sessilibus . . .*» GMEL., Fl. Sib. II p. 13 tab. IV fig. 2. — [*Sonchus sibiricus* L., Sp. pl. ed. I (1753) p. 795]; KITTLITZ, Denkw. II p. 304; ERMAN, Verzeichn. p. 57. — »*Sonchus* GM. Sib. II 13 No. 13» PENNANT, Arct. Zool. (1784) p. CXVI. — *Mulgedium kamtschaticum* LEDEB., Fl. Ross. II p. 845. — *Lactuca sibirica* BENTH., MAXIM. in Mél. Biol. IX (1874) p. 357; MIYABE, Fl. Kuril., p. 245; YABE & YENDO, Fl. Shimushu p. (197); KUDO, Fl. Paramush. p. 173.

Northern Kuriles: Paramushir Y. YEMOTO 1919 acc. to KUDO loc. cit.; Shumshu acc. to YABE & YENDO loc. cit.

South Kamtchatka: Cape Lopatka collected by cosacks 1909, do. BJELOUSSOF 1910; the mouth of Tsaots R. in Opala R. RUBINSKI 1909; the junction of Tolmachovaja rivers noted by HN; the mouth of Balangachik R. noted by HN; middle Karymchina R. Sept. 19th 1922 HN No. 4628; Bolsheredsk noted by HN; Paratunka STUBENDORFF; Bogatyrjovka July 16th 1920 HN No.

444; the mouth of Paratunka R. Aug. 17th 1920 Hn No. 823; Avatcha village Ramenski 1908; Savoiko Aug. 18th and 20th 1928 Malaise; Korjaka Komarov 1908.

East Kamtchatka: Petropavlovsk Stewart, do. Mertens, do. Dobrotvorsky 1881, do. Derbeck 1910, do. Perfiljef 1910, do. July 21st 1920 Hn No. 557, do. Aug. 17th 1920 Hn No. 912, do. July 22nd and Aug. 6th 1928 W. Eyerdam; Krutuberogaja Protopopof 1909; Ustj-Kamtchatsk July 1925 Malaise No. 564.

Central Kamtchatka: Mashura Protopopof 1908, do. Komarov 1909; Shtchapina Komarov 1909, do. Aug. 1st 1921 Hn No. 3501 (Malaise); Ushki acc. to Kittlitz loc. cit.; Klutchi Bezais 1908, do. Afanasejev 1909; Kamaki Gudzenko 1910.

West and North Kamtchatka: Utka Rubinski 1909; Tigil Levitzky 1848.

»Kamtchatka»: Steller and Krascheninnikof acc. to Gmel. loc. cit., Merk, Tilesius, Stewart, Lubarsky, Kastalsky, Kusmischeff, Mertens, Peters, Rieder.

In South Kamtchatka *M. sibiricum* occurs only in some scattered localities and is probably lacking in large parts of the district. Around Petropavlovsk it is more common. The plant thus shows the same tendency in Kamtchatka as it does in Europe, where its distribution is not confluent but concentrated around several different centra.

It flowers from the middle of July to September. The specimens belong partly to var. *integrifolium* Ledeb. and partly to var. *dentatum* Ledeb. both of which varieties seem to be of very little taxonomical value, although the specimens sometimes differ widely in regard to habitus. It is even probable that the form of the younger and that of the older leaves are so different that in some cases the same plant must be referred to different »varieties» in different stages of development.

Type of distribution: Eurasiatic.

Geographical area: Europe: (the area not confluent) from northernmost Scandinavia, Kola penins. and Archangelsk prov., southwards to Central Sweden, southern Finland (except S.W. part.), N.E. Estonia, St. Petersburg, Novgorod, Tver, Vologda, Vjatka, Ufa and Orenburg provinces. Asia: at Yenisei from about 69° N. lat., from lower Lena and Kolyma rivers and northern Kamtchatka, southwards to northern Akmolinsk prov. (also reported from Turkestan), northern Mongolia, southern Manchuria, Saghalin and central Yezo.

Sonchus arvensis L. var. **uliginosus** Trautv.

Yabe & Yendo, Fl. Shimushu p. (196).

The plant must have occurred only occasionally, having been introduced into Shumshu.

778. ***Lactuca repens*** (L.) BENTH. & HOOK., Genera Plant. II (1873) p. 526.

MAXIM. in Mél. biol. IX (1873) p. 364; YABE & YENDO, Fl. Shimushu p. (197). — »*Prenanthes repens, foliis trilobis*» L., Amoen. Acad. II ed. I (1751) p. 360 tab. 4 fig. 23 (Pl. Rar. Kamtsch. p. 27). — *Prenanthes repens* L., Sp. pl. ed. I (1753) p. 798 (pro errore typographico »*altissima*» cfr. errata); PENNANT, Arct. Zool. (1784) p. CXVI; GEORGI, Beschreib. III: 5 p. 1183. — *Nabalus repens* LEDEB., Fl. Ross. II p. 840. — *Chorisis repens* DC., Prodr. VII p. 178; HERDER, Pl. Radd. Monopet. No. 240 in Bull. Mosc. 43: 1 (1870) p. 192 et RADDE, Reisen III: 4 p. 49.

Northern Kuriles: Shumshu YENDO 1903 acc. to YABE & YENDO loc. cit.

East Kamtchatka: Cape Shipunski RIEDER 1831; the mouth of Tishaja R. KOMAROV 1909; Ustj Kamtchatsk PROTOPOPOF 1909, do. GUDZENKO 1910, do. July 14th and Sept. 10th 1927 MALAISE.

»Kamtchatka»: TILESIUS.

In Kamtchatka *L. repens* seems to be confined to the sandy beaches of the eastern shore. It flowers from the end of July to September.

Type of distribution: Asiatic Pacific.

Geographical area: On the sea-shore from eastern Kamtchatka over the Kuriles, Saghalin, Yezo, Honshu, Sikoku, Kiushiu, southern Ussuri, Corea, Liu-Kiu Islands, Formosa and China southwards to about Canton.

779. ***Crepis chrysantha*** (LEDEB.) FROEL. in DC., Prodr. VII (1838) p. 165.

[*Hieracium chrysanthum* LEDEB., Fl. Altaica IV (1833) p. 129.] — *Berinia chrysantha* SCH.-BIP., HERDER, Pl. Radd. Monopet. No. 246 in Bull. Mosc. 43: 1 (1870) p. 200 et RADDE, Reisen III: 4 p. 57.

South Kamtchatka: »In der Nähe der Lopatka» RIEDER; Shadutka volcano 1125 m. Aug. 2nd 1921 HN No. 2602; Topik 580 m. July 28th 1921 HN No. 2468; Assatcha mts. 1100 m. Aug. 18th 1922 HN No. 4187; Opala volcano 1100 m. July 23rd 1921 HN No. 2379; mt. Taburett, Lake Natchika Aug. 2nd 1924 P. T. NOVOGRABLENOF; Savoiko July 12th 1928 W. EYERDAM; sources of Poperochnaja R. SAVITCH 1908.

East Kamtchatka: Between Petropavlovsk and Savoiko (19 verst from Petropavlovsk) July 11th 1928 MALAISE; the Kronoki Pass KOMAROV 1909; Klutchevskaja volcano BEZAIS 1908, do. 3500 feet AFANASEJEV 1909, do. KOZLOVSKI 1909, do. Aug. 5th 1927 MALAISE; Stolbovoj R. AFANASEJEV 1909; the Chartchina mts. Aug. 12th 1927 MALAISE.

Central Kamtchatka: Sources of Gremushej R. KOMAROV 1908; Korjatskaja volcano Aug. 12th, 13th and 14th 1928 W. EYERDAM; sources of Kashkan R. KOMAROV 1909; Anauna R. Aug. 19th 1926 MALAISE No. 321 (var. *depilata*) and 323, do. Sept. 5th 1926 MALAISE No. 322; Klutchi, »the dry river» July 27th 1926 MALAISE No. 320.

In South Kamtchatka *C. chrysantha* is rare. It occurs in the high alpine region, or occasionally also in the lowlands, being washed down by the rivers. It flowers from the beginning of July to September.

Our plant agrees well with PRINTZ' figure (Veg. Sib. Mong. front. fig. 115). Most of the specimens have more lobate leaves than the bulk of the specimens from the Altai and Jakutsk distr. They should therefore be referred to f. *incisa* KRYL. (Fl. Altaja p. 757). MALAISE No. 321 differs from all others in the upper part of the stem and the involucral scales, which are only covered with short tomentum and glandular hairs, but are without the long blackish-green hairs otherwise so characteristic of *C. chrysantha*. It may be regarded as a separate variety var. *depilata*.

Type of distribution: Siberian.

Geographical area: Europe: E. Samoyede Land, the Urals, in Perm and Orenburg provinces. Asia: from Obi Bay, Noril mts., lower Lena R. and Chukch penins., southwards in the mts. to Altai, Sayan mts., northern Mongolia, Transbaikalia, Yakutsk prov. and S. Kamtchatka. (In Amur prov., on Saghalin, Yezo and the southern Kuriles, the related *C. burejensis* FR. SCHM.).

780. ***Crepis tectorum*** L., Sp. pl. ed. I (1753) p. 807.

HERDER, Pl. Radd. Monopet. No. 241 in Bull. Mosc. 43: 1 (1870) p. 193 et RADDE, Reisen III: 4 p. 50 (β *segetalis*).

Central Kamtchatka: Mashura PROTOPOPOF 1909; Tolbatchik KOMAROV 1909; Klutchi BEZAIS 1908 (Hb. Holm.), do. AFANASEJEV 1909, do. GRINOP 1909, do. PROTOPOPOF 1909, do. Aug. 14th 1927 MALAISE.

»Kamtchatka»: MERK acc. to HERDER loc. cit., »Petropavlovsk MERTENS».

This species was certainly introduced into our area. A native of Europe and Siberia, adventive in N. America.

Crepis tenuifolia WILLD.

Berinia tenuifolia SCH.-BIP., HERDER, Pl. Radd. Monopet. No. 244 in Bull. Mosc. 43: 1 (1870) p. 197 et RADDE, Reisen III: 4 p. 53.

The report of this plant from Kamtchatka was due to a specimen in Hb. Hort. Petrop. labelled »Kamtchatka LIBOSCHITZ Herb. FISCHER». Probably the Kamtchatka Province, not the Peninsula, was meant, and the species might have been collected at Ochotsk. The species should be excluded from the flora of our area.

Prenanthes alata (HOOK.) ASA GRAY.

Sonchus hastatus LESS., BONG. in Mém. Ac. Imp. Sc. St. Petersb. II Ser. VI (1833) p. 146. — *Nabalus alatus* LEDEB., Fl. Ross. II p. 840. — *Mulgedium hastatum* HERDER, Pl. Radd. Monopet. No. 250 in Bull. Mosc. 43: 1 (1870) p. 215 et RADDE, Reisen III: 4 p. 71.

The specimen that caused the above reports of *P. alata* from Kamtchatka is to be found in Hb. Hort. Petrop. and acc. to the label was collected by MERK (ex Hb. PALLAS) on Avatcha volcano. The report might be regarded as doubtful until it can be confirmed by a new find. As the plant occurs in the Aleutian Islands it

might well be expected in E. Kamtchatka. Besides being reported from Kamtchatka, *P. alata* is also reported from another place in Asia, viz. between Jakutsk and Ochotsk, as having been collected by LANGSDORFF, but that report is also doubtful.

781. ***Hieracium triste*** WILLD. ex SPRENGEL, Syst. Veg. III (1826) p. 640.

FEDTSCH., Fl. Îl. Comm. p. 80; KOM., Voy. Kamtch. p. 101; FERNALD in Rhodora 11 (1909) p. 141; KOIDZ., Pl. Yokoyam., Bot. Mag. Tokyo 25 (1911) p. 222; ZAHN in ENGLER, Pflanzenr. IV: 280 (Heft 79) p. 1134; HULTÉN in Sv. Bot. Tidskr. 22 (1928) p. 223. — »*Hieracium caule ramoso, foliis radicalibus ovatis dentatis, caulino minori*» GMEL., Fl. Sib. II p. 25 quoad pl. ex insula Beringii sec. FEDTSCH. loc. cit. — *Hieracium murorum* GEORGI, Beschreib. III: 5 p. 1212 quoad pl. ex insula Beringii. — *Hieracium vulgatum* LEDER., Fl. Ross. II p. 851 quoad pl. ex insula Beringii sec. FEDTSCH. loc. cit. — *Pilosella tristis* SCH.-BIP., HERDER, Pl. Radd. Monopet. No. 250 in Bull. Mosc. 43: 1 (1870) p. 204 et RADDE, Reisen III: 4 p. 61.

South Kamtchatka: Sholtovskaja volcano 500 m. Aug. 23rd 1922 HN No. 4375; sources of Kidipalok R. 500 m. noted by HN; Akhomten Bay 250 m. Sept. 9th 1920 HN No. 1212; do. Sept. 11th 1920 HN No. 1292 a and b, do. 500 m. Sept. 13th 1920 HN No. 1376, do. Sept. 21st 1920 HN No. 1434; the Kohelok Pass 650 m. noted by HN; mt. Trubi KOMAROV 1908; Shalsan KOMAROV 1908, do. 700 m. Sept. 1st 1921 HN No. 2988; mt. Tshemuchka, Ozdetz R. KOMAROV 1908; mt. Tshapochka, Natchika KOMAROV 1908; Poperochnaja R. KOMAROV 1908.

East Kamtchatka: The »Pinatcheva Pass» Aug. 2nd 1928 W. EYERDAM; Nalutcheva hot springs Aug. 1st 1928 W. EYERDAM; the foot of Kichpinitch volcano KOMAROV 1909; Kronoki Pass KOMAROV 1909, do. Aug. 30th 1921 HN No. 3530 (MALAISE); the foot of Klutchevskaja volcano KURTASHOF 1909; Klutchevskaja volcano Aug. 6th 1927 MALAISE.

Commander Islands: Bering Island STELLER acc. to FEDTSCH. loc. cit., VOSSNESENSKY 1844, KJELLMAN, DYBOVSKY 1879, GREBNITZKY 1894, YOKOYAMA acc. to KOIDZ. loc. cit., STEJNEGER acc. to FEDTSCH. loc. cit.; Copper Island DYBOVSKY 1879, GREBNITZKY and MOROZEVICZ acc. to FEDTSCH. loc. cit.

Central Kamtchatka: Korjatskaja volcano Aug. 13th 1928 W. EYERDAM; Ganala RIEDER 1833.

»Kamtchatka»: CHAMISSO, CHORIS, KASTALSKY, KUSMISCHEFF, collector unknown »acc. a D. PRESCOTT 1831 Hb. MEYER», »Petropavlovsk MERTENS», PETERS 1831, RIEDER 1831.

H. triste occurs here and there in the meadows of the alpine region of South Kamtchatka, in some districts even comparatively commonly.

Specimens as delicate and with as small an involucrum as the North and South American relative of our plant, *H. gracile* HOOK., are sometimes found (for instance HN No. 1292 b), but they are not floccose, like that species. *H. gracile* is a pure American type and has such close relatives even in south-

ernmost S. America (*H. magellanicum* Sch.-Bip.) that such similar forms within most other genera would be referred to the same species.

Type of distribution: Northern Pacific.

Geographical area: Asia: Commander Islands, Eastern and Southern Kamtchatka. America: the Aleutian Islands, southern coast of Alaska at least to Yakutat Bay (acc. to Howell to N. Washington).

782. ***Hieracium umbellatum*** L., Sp. pl. ed. I (1753) p. 804.

Ledeb., Fl. Ross. II p. 855; Herder, Pl. Radd. Monopet. No. 254 in Bull. Mosc. 43: 1 (1870) p. 209 et Radde, Reisen III: 4 p. 65; Zahn in Engler, Pflanzenr. IV: 280 (Heft 79) p. 910 (subsp. *umbellatum* var. β *pervagum* Jord). — *Hieracium crocatum* Fries, Epicris Gen. Hierac. p. 124 quoad pl. Kamtsch.; Herder, Pl. Radd. Monopet. in Bull. Mosc. 43: 1 (1870) p. 207 et Radde, Reisen III: 4 p. 63 quoad pl. Kamtsch.

South Kamtchatka: 20 km N. of Javina Aug. 10th 1921 Hn No. 2788; lower Kochegochek R. noted by Hn; Sahach noted by Hn; the hot springs at Shadutka Aug. 12th 1922 Hn No. 4237; the hot springs at upper Opala R. Aug. 2nd 1922 Hn No. 4133; Akhomten Bay Sept. 21st 1920 Hn No. 1440; lower Tolmachovaja R. noted by Hn; middle Karymchina R. noted by Hn; »Alochkin tundra», Paratunka R. Komarov 1908; Lake Natchika Ramenski 1908; mt. Zerkalo, Natchika Komarov 1908; Savoiko July 27th and 31st and Aug. 4th 1928 W. Eyerdam, do. July 23th and Aug. 18th Malaise 1928.

East Kamtchatka: The entrance of Avatcha Bay Perfiljef 1911; Petropavlovsk Dobrotvorsky 1881, do. Gudzenko 1910, do. Perfiljef 1910, do. Aug. 8th 1928 W. Eyerdam; Kalashtyrka Perfiljef 1910 (sub *H. boreale*); between Petropavlovsk and Avatcha volcano 350 m. Aug. 23rd 1920 Hn No. 997; Avatcha volcano 690 m. July 31st 1920 Hn No. 656 and 658, do. Aug. 25th 1928 W. Eyerdam; Uzon Komarov 1909; Lake Assabatche Aug. 15th 1925 Malaise No. 567; Ustj-Kamtchatsk Aug. 25th 1925 Malaise No. 566.

Central Kamtchatka: Between Mashura and Shtchapina Komarov 1909: Shtchapina Komarov 1909; Kunchekla Grinop 1909; Klutchi Aug. 10th 1926 Malaise No. 319.

West and North Kamtchatka: Tigil Levitzky.

»Kamtchatka»: Eschscholtz, Lubarsky, Rastargujeff, Stewart, Kastalsky, Kusmischeff, Mertens, Rieder.

In South Kamtchatka this plant occurs here and there in the meadows and *Betula* forests. Here as well as in other countries it is very variable and the specimens enumerated above belong to several different forms. The species is thus taken here in the wide sense.

Type of distribution: Circumpolar.

Geographical area: Throughout Europe, Asia and America, southwards to Asia Minor, India, China, Honshu, California and Minnesota.

Additions and Corrections.

In the course of writing the present work the author has had the advantage of receiving from later collectors, chiefly Mr. R. Malaise and Mr. W. Eyerdam, new material from the area of this flora. This material has been incorporated in the work as far as the hitherto unpublished parts are concerned. Certain additions originating from those collections and concerning those parts of the flora that had already been published when the collections came into my hands are made in the following pages, except in cases where the plant had already been enumerated before from the same locality. In some cases important quotations are also added from literature which had earlier escaped my attention.

Practically simultaneously with the publication of the first part of this flora Prof. Komarov, of Leningrad, published the first part of a similar work »Flora Peninsulae Kamtschatka I» in Russian, with an English summary, and just when this part of my flora was about to be printed the second part of Komarov's work comprising the families *Salicaceae—Ericaceae* appeared. In cases where his determinations differ from mine, the fact has almost invariably been already noted in my work, as I have had the advantage of studying all the older material preserved in Leningrad, including his collections. It is not necessary, therefore, for the proper comprehension of the subject, to cite here his work in respect of every species. The corresponding plant in my flora can easily be found with the aid of the Index. Only in a few cases in which there might be some misinterpretation or where some important additions are made, I have quoted Komarov's work in this supplement. Komarov, as a result of his journeys, enumerates several localities which are not found in my work. As I have seen all of his material that is preserved in Leningrad and Berlin, and as Komarov himself assumes that only duplicates were distributed to foreign museums, I take those localities to be the places where the species in question was noted during the field-work. Unfortunately, there is usually no differentiation made between collected specimens and notes in Komarov's work. In most cases those additional localities lie between those already mentioned in this flora on the route followed by Komarov from Petropavlovsk up to Lake Kronoki and back along the sea coast to Petropavlovsk. (Compare map on p. 317.) For these reasons it would be of little value to enumerate them here. However, if the localities in any way widen the area of the species on Kamtchatka they are quoted below. If for any reason the author regards a locality as doubtful it is not quoted.

The above reasoning may be summarized thus: In the following »additions and corrections» some new collections are added which had earlier been published only in part. Only important quotations are given from literature. A number of obvious misprints in the earlier volumes have been corrected.

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6. Acc. to AFZELIUS (Egenhändiga anteckningar af CARL LINNAEUS om sig sielf, 1823 pp. 54, 222) LINNAEUS himself says that the Kamtchatka plants that he obtained from DEMIDOFF were collected by STELLER. Acc to JACKSON (Index Linn. Herb. 1912 p. 12) DEMIDOFF sent 800 plants to LINNAEUS (letter May 15th 1750) containing also STELLER's plants from Kamtchatka.

8. Some of STELLER's plants are, acc. to JACKSON (Index Linn. Herb. London 1912 p. 12), to be found in the Linnean Herbarium, London. They are marked with the sign ☋. The meaning of that sign has been much discussed. It seems to me that the semicircle means Asia and the cross on its »eastern» side the peninsula Kamtchatka.[1]

9. Line 2 from the end, for CHORMICH read CHORNICH.

10. An account of the expedition of RODGERS and RINGOLD is given by Lieut. B. HABERSHAM in his popular book »My last Cruise». The scientific results of the expedition were never published. Comp. Fern Bull. 9 (1901) pp. 53—54.

In the column of literature: instead of »KJELLMAN 1888» read »KJELLMAN 1886» and instead of »KOMAROV 1911 (1—3) read »KOMAROV1904, 1911».

11—12. The routes of KOMAROV, BEZAIS, RAMENSKI, RUBINSKI and PROTOPOPOF are given in detail by KOMAROV (Fl. Penins. Kamtsch. 1 pp. 15—33).

To the list of botanical collectors may be added the following: SEEMAN, B., botanist of the Herald expedition visited Petropavlovsk Aug. 7th—14th 1848. The collections are found i Kew herb. VOEIKOV, K., collected in 1881 on Copper Island. Collections in Hb. Moskva (Comp. NAZAROV in Bull. Jard. Bot. Princip. U. R. S. S. XXV: 3 (1926) p. 300). STAROKADOMSKI, L. M., physician attached to the polar expedition of Taimyr and Vaigatch, made a small collection in Kamtchatka. BJELOUSOF, V. and SKOBUNOF, V. followed the surveying-ship »Ochotsk» on its voyages along the coast of Kamtchatka and made collections, chiefly in the northern part of the area. W. J. EYERDAM, of Seattle, with the assistance of Mr. COULTAS made in 1928 at Petropavlovsk, Savoiko, Mt. Palovinaja and Korjatskaja volcano (COULTAS also at the hot spring at Nalutcheva R.) a comparatively large collection, part of which has already been dealt with in this flora, and the remainder will be dealt with in the supplement. As it was not clear from the labels who was the collector in each particular case, EYERDAM, who apparently did most of the collecting, is always cited as collector. VAVILIN collected some few specimens in 1927 between Jelovka and Se-

[1] Some of the other signs that are found in the herbarium of LINNAEUS (Compare JACKSON Index Linn. Herb. 1912 p. 19) can be explained in the same way viz ☾ = on the western edge of Asia, ☽ = Eastern Asia, ☌ = central part of Asia. The custom of representing Asia as a semicircle is very old. Even the mediaeval cosmographers used to represent the inhabited earth by a circle which was divided into three parts by a T, the half circle thus formed being Asia, the two quarter circles Europe and Africa respectively.

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danka. In Fl. Penins. Kamtsch. II Komarov enumerated collections made at Karaginsk Island in 1928 by D. D. Kanakin and V. J. Razumovski and on the western coast of Kamtchatka in 1929 by A. A. Krashuk. H. Namura 1884, Akakabe 1884, Kodama 1893 and T. Ishikawa 1894 collected some few specimens on Shumshu. Some collectors on which I have no data and which collected only single specimens are not enumerated in the list of collectors.

14. The village of Savoiko has lately been renamed. Its present name is Jelisovo (Elizovo).

29. *Woodsia ilvensis;* add: Tarja Bay and Natchika acc. to Kom. loc. cit.; Savoiko June 28th 1928 Malaise, do. Sept. 1st 1928 W. Eyerdam; Korjatskaja volcano Aug. 14th 1928 W. Eyerdam.

29. *Cystopteris fragilis;* add: Nikolajevsk, »Podpruginski Pad» Aug. 28th 1928 Malaise.

30. *Struthiopteris filicastrum;* add: Savoiko July 27th 1928 W. Eyerdam; between Petropavlovsk and Savoiko July 25th 1928 W. Eyerdam.

32. *Dryopteris fragrans.* The synonym *Aspidium fragile* should be eliminated.

Add to the localities: S.W. of Tolbatchik on the lava-stream »Kekuri» July 17th 1928 P. T. Novograblenof.

33. *Dryopteris Linnaeana;* add: Nikolajevsk, »Podpruginski pad» Aug. 26th 1928 Malaise; Mt. Palovinaja Aug. 1st 1928 W. Eyerdam. Komarov loc. cit. enumerates several localities in the Central Valley and on the eastern coast between Lake Kronoki and Petropavlovsk.

36. *Dryopteris phegopteris* var. *cruciata*; add: Nikolajevsk, »Podpruginski pad.» Aug. 26th 1928 Malaise.

38. *Dryopteris thelypteris* var. *kamtschatica* Komarov (Fl. Penins. Kamtsch. I p. 58) cites this plant from two more hot springs, viz. that at Pushtchina (Kashkan R.) and that at Siku R.

Fernald (Rhodora 31, 1929 pp. 27—38) states that the Kamtchatka-plant is identical with *Lastrea Thelypteris* α *pubescens* Lawson and considers that its proper name should be *Thelypteris palustris* (Salisb.) Schott var. *pubescens* (Lawson) Fernald. It is distributed from Newfoundland to Manitoba, southwards to Georgia and Oklahoma and from S. Kamtchatka to Manchuria.

38. *Polystichum Braunii* var. *kamtschaticum.* The same variety is described by Komarov (Fl. Penins. Kamtsch. I p. 64) as var. *subsessile* Kom. The different forms of our species were recently dealt with by Fernald in Rhodora 30 (1928) p. 28.

40. *Athyrium alpestre;* add: Korjatskaja volcano Aug. 14th 1928 W. Eyerdam.

41. *Athyrium filix femina;* Komarov (Fl. Penins. Kamtsch. I pp. 66, 68) enumerates localities in Central Kamtchatka northwards to Milkova and Kirganik and along the eastern coast between Lake Kronoki and Petropavlovsk.

42. Add: ***Asplenium Kamtchaticum*** D. Gilbert in Fern. Bull. 9 (1901) p. 53—54. This doubtful fern was collected by Wright. It was labelled »*Asplenium filix foemina* Bernh. C. Wright Coll. Ochotsk Sea. J. Small.»

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The same plant was collected on Yezo by RODGERS' and RINGOLDS' expedition, which WRIGHT accompanied. It must be regarded as doubtful whether the specimen originates from Kamtchatka.

44. *Pteridium aquilinum;* KOMAROV (Fl. Penins. Kamtsch. I p. 70) enumerates several localities from Central and Eastern Kamtchatka. The species thus seems to occur within an area confined to the north and west by the valley of the Kamtchatka river and to the south by the valley of the Bolshaja river.

44. Add: No. 783 (Suppl. No. 1) ***Polypodium vulgare*** L., Sp. pl. ed. I (1753) p. 1085.

Central Kamtchatka: Near Kosyrevsk acc. to P. T. NOVOGRABLENOF in letter.

This species was earlier reported from Kamtchatka (Cfr. Part I p. 44) by RUPRECHT. That report alone was in my opinion not enough to establish the fact that the species really occurred there. The find of NOVOGRABLENOF, however, shows that a plant of this type really exists within our area. Until the specimens have been critically revised, however, the possibility still exists that they belong to the closely related Japanese *P. Fauriei* CHRIST.

Type of distribution: Cosmopolite.

Geographical area: Practically the whole of Europe; throughout Asia; Eastern N. America, Alaska; N. and S. Africa; the N. Atlantic Islands, Kerguelen, Hawaji.

45. *Osmunda banksiifolia;* The source of the report of this plant from Kamtchatka is to be found, acc. to information kindly given to me by Prof. DIELS, in HOOK. and BAKER, Synops. Fil. (1883) p. 426, where *Osmunda javanica* is reported as occurring from Kamtchatka to Java and Ceylon.

45. *Ophioglossum vulgatum* L. var. *alaskanum;* add: the hot springs at Nalutcheva R. July 31st 1928 W. EYERDAM.

46. *Botrychium boreale;* add: Pushtchina acc. to KOM., Fl. Penins. Kamtsch. I p. 75; mt. Palovinaja Aug. 1st 1928 W. EYERDAM.

47. *Botrychium lanceolatum;* add: mt. Palovinaja Sept. 1st 1928 W. EYERDAM. KOMAROV (Fl. Penins. Kamtsch. I p. 76) reports this species also from Uzdets R., Natchika, Pushtchina and Shtchapina.

49. *Botrychium multifidum;* add: Savoiko Aug. 31st 1928 MALAISE. KOMAROV (Fl. Penins. Kamtsch. I p. 77) enumerates localities from the eastern coast between Lake Kronoki and Petropavlovsk.

50. *Equisetum arvense;* add: Avatcha volcano Aug. 25th 1928 W. EYERDAM.

52. *Equisetum limosum;* add: Savoiko July 27th 1928 W. EYERDAM. KOMAROV (Fl. Penins. Kamtsch. I p. 87) enumerates several localities in Central and East Kamtchatka, the northernmost being Ozernaja (eastern coast) SKOBUNOV 1920.

52. *Equisetum hiemale;* KOMAROV (Fl. Penins. Kamtch. I p. 79) enumerates several localities in the Central valley.

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55. *Equisetum silvaticum;* add: Savoiko Sept. 1st 1928 W. Eyerdam; Hutor W. Eyerdam 1928; Ozernaja (eastern coast) Skobunov 1920 acc. to Kom. Fl. Penins. Kamtsch. I p. 82.
56. *Equisetum scirpoides;* add to the synonyms: *Equisetum variegatum* var. *alpicolum* Kom., Fl. Penins. Kamtsch. I p. 81 saltem pro parte.
56. *Equisetum variegatum:* add to the synonyms: *Equisetum palustre* var. *simplicissimum* f. *tenue* Kom., Fl. Penins. Kamtsch. I p. 86 and to the localities: Korjatskaja volcano Aug. 12th 1928 W. Eyerdam.
56. *Lycopodium alpinum;* add: Ozernaja (eastern coast) and Uka Skobunov 1920 acc. to Kom., Fl. Penins. Kamtsch. I p. 93.
57. *Lycopodium annotinum;* add to the synonyms: *Lycopodium annotinum* and *Lycopodium pungens* Kom., Fl. Penins. Kamtsch. I pp. 89, 90.
59. *Lycopodium clavatum;* add: Mertens, Bemerk. Fl. Koragins p. 62. Mertens loc. cit. reports the species from Karaginsk Island.
60. *Lycopodium complanatum*; add: Hutor and Savoiko July 1st 1928 W. Eyerdam; between Jelovka and Sedanka Aug. 20th 1927 Vavilin.
61. *Lycopodium obscurum;* add: Hutor July 1st 1928 W. Eyerdam; Savoiko 1928 W. Eyerdam; Lake Natchika acc. to Kom., Fl. Penins. Kamtsch. I p. 89.
61. *Lycopodium selago;* add: Chartchina mts. Aug. 12th 1927 Malaise.
62. *Lycopodium sitchense.* Acc. to Fernald in Rhodora 25 (1923) p. 166 this plant should be regarded as a variety of *L. sabinaefolium* Willd. and its name should be *L. sabinaefolium* var. *sitchense* (Rupr.) Fern.
63. *Selaginella Schmidtii*; add: Savoiko Sept. 1st 1928 W. Eyerdam; »*Lycopodium rupestre* ex Kamtschatka Hb. Schwartz Det. Hieron.»
64. *Selaginella selaginoides;* acc. to Kom., Fl. Penins. Kamtsch. I p. 96 collected by Rieder at Cape Lopatka.
64. *Isoetes echinosporum.* Acc. to Iversen (Bot. Tidskr. København. 40 (1928) p. 126) var. *Braunii* should be included in *I. echinosporum:* Its area is not separated geographically from that of *I. echinosporum.* From Kamtchatka Iversen mentions f. *oligostomum* and f. *astomum.*
67. *Pinus pumila* was recently reported also from N.E. Mongolia by Pavlov (Bull. Soc. Nat. Mosc. 38, 1929, p. 8).
68. *Larix dahurica.* Acc. to Pilger in Engler-Prantl., Natürl. Pflanzen Fam. ed. 2 Bd. 13 (1926) p. 327 the name of the plant should be *Larix Gmelini* (Rupr.) Ledeb.

A map of its distribution is given by Ostenfeld in Pflanzenareale Reihe 2 Heft 7.

68. *Picea jezoensis.* Recently Lacassagne (Bull. Soc. Hist. Nat. Toulouse T. LVIII (1929) pp. 637—638) has reported a new species of spruce *P. Kamtschatkensis* from Central Kamtchatka. It must be said that there is little probability that the existence of two different species of spruce there should have escaped the attention of Ditmar, Komarov, Malaise, and others who worked in the central part of the peninsula, and also be unknown to the

population there. The range of variation of the *Picea jezoensis* of Kamtchatka must be well studied before a closely related form can be distinguished as a separate species. Unfortunately the herbarium material of the plant is for the present very small.

70. *Juniperus communis* var. *montana.* KOMAROV, Fl. Penins. Kamtsch. I p. 105 enumerates several localities in the central valley and along the eastern coast between Lake Kronoki and Petropavlovsk, also collected at Ozernaja (eastern coast) by SKOBUNOV.

72. *Typha latifolia;* add: the hot springs at Nalutcheva July 30th 1928 W. EYERDAM.

72. *Sparganium affine;* add: Savoiko July 29th 1928 W. EYERDAM.

Acc. to FERNALD (Rhodora 24, 1922, p. 33) the plant should be named *S. angustifolium* MICHX.

73. *Sparganium glomeratum;* add: Savoiko July 29th 1928 MALAISE.

73. *Sparganium hyperboreum;* add: Hutor July 19th 1928 W. EYERDAM; Savoiko Aug. 1st 1928 W. EYERDAM; Palovinaja R. Sept. 1st. 1928 W. EYERDAM.

74. *Sparganium simplex;* add: Hutor July 20th 1928 W. EYERDAM; do. Sept. 6th 1928 MALAISE; Savoiko Aug. 6th 1928 W. EYERDAM.

75. *Zostera japonica;* add to the synonyms: *Zostera nana* KOM., Fl. Penins. Kamtsch. I p. 113.

76. *Potamogeton filiformis;* add: Hutor July 1st 1928 W. EYERDAM.

76. *Potamogeton gramineus*; add: Hutor July 7th and Aug. 6th 1928 W. EYERDAM; mt. Palovinaja Sept. 1st 1928 W. EYERDAM.

78. *Potamogeton panormitanus;* add to the synonyms: *P. pusillus* KOM., Fl. Penins. Kamtsch. I p. 121 pro parte.

78. *Potamogeton pectinatus;* add to the synonyms: *P. pusillus* KOM., Fl. Penins. Kamtsch. I p. 121 pro parte.

80. *Potamogeton pusillus;* add: Savoiko July 20th 1928 MALAISE, do. Sept. 1st 1928 W. EYERDAM.

82. *Alisma plantago-aquatica;* add to the synonyms PENN., Arct. Zool. (1784) p. CXV.

83. *Phalaris arundinacea*. KOMAROV (Fl. Penins. Kamtsch. I p. 130) enumerates several localities in the Central Valley and on the eastern coast between Lake Kronoki and Petropavlovsk.

85. ***Hierochloë japonica*** MAXIM. YABE & YENDO, Fl. Shimushu p. (175).

This plant is reported as collected by YENDO on Shumshu. KUDO does not enumerate it in his list of the plants of Yezo (Jap. Journ. Bot. II 1925 p. 240) and MATSUMURA (Index Plant. Jap. II p. 58), who usually cites YABE & YENDO, only mentions the species from Honshu and Sikoku. The report must be regarded as doubtful.

85. *Hierochloe odorata;* add: Hutor July 19th 1928 MALAISE.

87. *Milium effusum;* add: Savoiko July 12th, 15th and 26th 1928 W. EYERDAM. To the geographical area should be added Iceland.

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89. *Phleum pratense;* add: Savoiko July 26th 1928 MALAISE.

89. *Alopecurus aequalis;* add: Savoiko June 29th 1928 W. EYERDAM.

90. *Alopecurus alpinus* var. *Steinegeri;* add: the hot spring at Nalutcheva July 31st 1928 P. T. NOVOGRABLENOF; Pinatcheva mts. Aug. 2nd 1928 W. EYERDAM.

95. *Agrostis borealis*; add: Korjatskaja volcano Aug. 13th 1928 W. EYERDAM.

96. *Agrostis clavata;* add: Hutor July 19th 1928 MALAISE; Savoiko Aug. 28th 1928 W. EYERDAM.

97. *Agrostis hiemalis;* add: Savoiko Aug. 2nd 1928 W. EYERDAM.

99. *Calamagrostis deschampsioides;* add: East Kamtchatka: Petropavlovsk July 10th 1928 W. EYERDAM.

100. *Calamagrostis Langsdorffii.* The question of the relation between *Calamagrostis Langsdorffii* and *Calamagrostis canadensis* was dealt with by INMAN in Rhodora 24 (1922) p. 142.

INMAN considers our plant to be a variety of *Calamagrostis canadensis.* STEBBINS, who recently published a monographical treatment of this group in America (Rhodora 32, 1930 pp. 35—37) came to the same conclusion.

105. *Calamagrostis purpurascens;* add: mt. Palovinaja Aug. 1st 1928 W. EYERDAM.

106. *Calamagrostis sachalinensis;* add: Nikolajevsk »Podpruginski pad» Aug. 26th 1928 MALAISE; Petropavlovsk Aug. 12th 1928 W. EYERDAM; the Shalsan Pass KOMAROV 1908 acc. to KOM., Fl. Penins. Kamtsch. I p. 148 sub *Calamagrostis Litwinowi.*

110. *Deschampsia flexuosa;* add: between Jelovka and Sedanka Aug. 20th 1927 VAVILIN.

113. *Trisetum sibiricum.* KOMAROV (Fl. Penins. Kamtsch. I p. 156) enumerates several localities in the Central Valley and on the eastern coast between Lake Kronoki and Petropavlovsk.

118. *Avena planiculmis.* KOM., Fl. Penins. Kamtsch. I p. 159 enumerates some further localities: Rakovaja Bay RIEDER 1831; Vershne Kamtchatsk DYBOVSKY; Jelovka PROTOPOPOF 1909; Karaginsk Island MERTENS.

118. *Avena striata.* The proper name of this plant, acc. to JASON R. SWALLEN (The grass genus *Schizachne* Journ. Wash. Acad. Sc. 18, 1928 p. 203) is *Schizachne purpurascens* (TORR.) SWALL.

119. *Danthonia intermedia.* KOMAROV (Fl. Penins. Kamtsch. I p. 160 sub *Avena Riaboushinskii*) enumerates localities in the Central Valley northwards to Milkova and mt. Kunchekla.

119. *Beckmannia baicalensis.* In Rhodora 30 (1928) p. 27 FERNALD has pointed out that this plant was earlier named *Panicum Syzigachne* by STEUDEL (Flora 29, 1846 p. 19) and that it should therefore be named ***Beckmannia Syzigachne*** (STEUD.) FERNALD.

121. »*B. eruciformis* var. *baicalensis*» was reported by ŠIRJAEV (Acta Bot. Bo-

hemica II, 1923 p. 41) from the mouth of Obi R. and that plant should therefore naturally be referred to *B. Syzigachne.*

134. *Poa radula;* add: Krutugorovaja Zelenin 1908 acc. to Kom., Fl. Penins. Kamtsch. I p. 176.

141. *Puccinellia paupercula;* add: Petropavlovsk Aug. 6th 1928 W. Eyerdam.

142. *Festuca altaica;* add: Hutor June 30th 1928 Malaise; mt. Palovinaja Aug. 1st 1928 W. Eyerdam; Klutchevskaja volcano July 22nd 1927 P. T. Novograblenof.

144. *Festuca brevifolia;* add: Klutchevskaja volcano N.E. slope, 1000 m. July 22nd 1927 P. T. Novograblenof; Siminaja volcano N. slope July 23rd 1927 P. T. Novograblenof.

146. Among the synonyms under *Bromus arcticus* is *Bromus Parkeri*, for which read *Bromus Porteri.* Add to the list of localities: the hot spring at Nalutcheva R. July 31st 1928 W. Eyerdam.

150. *Agropyron mutabile.* This species occurs also in Semiretchensk prov. (Kopal). Acc. to Vestergren (Berichte Schweizer. Bot. Ges. Heft 48, 1929 p. 41) it is possibly synonymous with *Agropyron Richardsonii* Schrad. in which case it should be a practically circumpolar plant. Acc. to verbal information of dr. M. Malte, however, the American *A. Richardsonii* is distinct from *A. mutabile.*

158. *Eriophorum alpinum;* add: Nemtik (southern Westcoast) Rubinski 1908 acc. to Kom., Fl. Penins. Kamtsch. I p. 205; the hot springs at Nalutcheva R. July 31st 1928 W. Eyerdam. Komarov also reports the plant from the eastern coast S. of Lake Kronoki. Acc. to Nakai the species is also found in northern Corea. It is reported under the name *Trichophorum alpinum* by Komarov (Fl. Penins. Kamtsch. I p. 205).

159. *Eriophorum angustifolium;* add: Hutor June 30th 1928 Malaise; Savoiko Aug. 3rd and Sept. 1st 1928 W. Eyerdam; between Savoiko and Korjaka July 18th 1928 Malaise.

164. *Scirpus caespitosus;* add: Savoiko July 2nd and 3rd 1928 W. Eyerdam, do. July 4th 1928 Malaise; Petropavlovsk Aug. 12th and 13th 1928 W. Eyerdam. The species is reported under the name of *Trichophorum caespitosum* by Komarov (Fl. Penins. Kamtsch. I p. 205).

166. *Scirpus kamtschaticus.* Acc. to Fernald and Brackett (Rhodora 31 (1929) pp. 75—76) this species was found at Yes Bay, Alaska.

169. *Scirpus palustris;* add: Hutor June 27th 1928 Malaise; Savoiko June 27th 1928 W. Eyerdam; mt. Palovinaja Sept. 1st 1928 W. Eyerdam.

172. *Cobresia Bellardi;* add: Simina volcano (Klutchevskaja range) July 23rd 1927 P. T. Novograblenof.

173. *Carex gynocrates;* add: Hutor June 30th 1928 Malaise and Eyerdam; the left Shtchapina R. and Lake Kronoki acc. to Kom., Fl. Penins. Kamtsch. I p. 223.

175. *Carex pauciflora.* Komarov (Fl. Penins. Kamtsch. I p. 224) reports this species also from Kirganik (Komarov 1909) and Lake Kronoki (Komarov 1909).

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178. *Carex macrocephala.* Acc. to FERNALD (Rhodora 32, 1930 p. 9) the Western American plant hitherto taken as *C. macrocephala* should be referred to *Carex anthericoides* PRESL. Our plant, which is thus an Asiatic Pacific and not a Northern Pacific species, has recently been found also on the shores of New Jersey.

180. *Carex glareosa;* add: South Kamtchatka: Hutor June 26th 1928 W. EYERDAM. East Kamtchatka: Petropavlovsk July 8th 1928 W. EYERDAM.

181. *Carex norvegica.* KOMAROV reports this species from Rakovaja Bay (Avatcha Bay) collected by P. T. NOVOGRABLENOF 1925.

182. *Carex traiziscana;* add: Savoiko Aug. 3rd 1928 W. EYERDAM.

183. *Carex tenuiflora;* add: Hutor July 1st 1928 W. EYERDAM; Savoiko July 3rd 1928 W. EYERDAM.

184. *Carex loliacea;* add: South Kamtchatka: Hutor June 30th 1928 W. EYERDAM; Savoiko June 28th 1928 MALAISE.

188. *Carex Ramenskii;* add: Petropavlovsk July 12th 1928 W. EYERDAM. The specimens collected by EYERDAM are even in regard to habitus in close agreement with *C. subspathacea* and I can see no reason for keeping *C. Ramenskii* as a distinct species. *C. subspathacea* is an arctic circumpolar species.

194. *Carex Tolmiei;* add: Korjatskaja volcano Aug. 13th 1928 W. EYERDAM; Klutchevskaja volcano Aug. 6th and 7th 1927 MALAISE.

194. *Carex Krascheninnikovi* = *C. atrofusca* var. *fulvicoma* KOM., Fl. Penins. Kamtsch. I p. 261.

196. *Carex scita;* add: Avatcha volcano Aug. 27th and 28th 1928 W. EYERDAM; Korjatskaja volcano Aug. 13th 1928 W. EYERDAM.

196. *Carex scita* var. *karaginensis;* add: the hot springs at Nalutcheva R. July 30th 1928 W. EYERDAM; Klutchevskaja volcano Aug. 6th 1927 MALAISE.

198. *Carex amblyolepis;* add: Savoiko June 6th and 7th 1928 MALAISE.

201. *Carex limosa;* add: Hutor June 30th 1928 MALAISE; Milkova Aug. 13th 1927 P. T. NOVOGRABLENOF.

202. Add: No. 784 (Suppl. No. 2) ***Carex laxa*** WAHLENB. in Kongl. Vet. Acad. Nya Handl. Stockholm 24 (1803) p. 156.

South Kamtchatka: Hutor June 30th 1928 MALAISE (together with *C. limosa*).

New to the flora of Kamtchatka.

Type of distribution: Eurasiatic.

Geographical area: Known from scattered localities: Europe: northern Scandinavia, N.W. Finland and N. Karelia. Asia: lower Obi R. between 60° and 62° N. lat.; Pur R., Obi Bay, about 64° N. lat.; Bureja distr., Manchuria, Yezo, Honshu and Kamtchatka. As the species seems to be rare in all parts of its area it is possible that it has been overlooked in large parts of Siberia and northern Russia.

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202. *Carex livida;* add: Petropavlovsk Aug. 14th 1928 W. EYERDAM; Uzon acc. to KOM., Fl. Penins. Kamtsch. I p. 260.

Acc. to KRYLOV, Fl. Sibir. occident. vyp. III (1929) p. 503 this plant has been found in northern Tobolsk prov. (basin of Pur R).

204. *Carex misandra;* add: the hot springs at Nalutcheva R. Aug. 1st 1928 W. EYERDAM.

205. *Carex ruesanensis.* KUDO (Journ. Coll. Hokkaido Imp. Univ., Sapporo XII: 1, 1923 p. 25) reports this plant also from Saghalin.

205. *Carex longerostrata.* KOMAROV reports several localities in the Central Valley and on the eastern coast between Lake Kronoki and Petropavlovsk.

209. *Carex laevirostris;* add: Mt. Korjatskaja Aug. 12th 1928 W. EYERDAM.

212. *Carex lasiocarpa;* add: Tolbatchik acc. to KOM. Fl. Penins. Kamtsch. I p. 269.

215. *Calla palustris;* add: »mt. Tolbatchik» collected by KORNIENKO acc. to W. EYERDAM in letter.

216. Add: **Commelinaceae** RCHB. **Commelina communis** was reported by KOMAROV (Fl. Penins. Kamtsch. II p. III) as collected in Kamtchatka by NOVOGRABLENOF. It was certainly introduced into our area.

216. *Juncus balticus;* add: the synonym *J. Haenkei* KOM., Fl. Penins. Kamtsch. I p. 278 and the localities Hutor Aug. 16th 1928 W. EYERDAM; Petropavlovsk Aug. 14th 1928 W. EYERDAM.

218. *Juncus biglumis;* add: Klutchevskaja volcano Aug. 6th 1927 MALAISE.

218. *Juncus bufonius;* add the synonym *J. ranarius* KOM., Fl. Penins. Kamtsch. I p. 276 and the localities Savoiko July 3rd and 31st 1928 W. EYERDAM.

219. *Juncus castaneus;* add: Savoiko July 17th 1928 W. EYERDAM.

220. *Juncus filiformis;* add: Petropavlovsk July 10th 1928 W. EYERDAM; Ozernaja (E. coast) SKOBUNOV 1920 acc. to KOM., Fl. Penins. Kamtsch. I p. 277.

221. *Juncus lampocarpus;* add: the hot spring at Nalutcheva R. July 31st 1928 W. EYERDAM.

223. Add: No. 785 (Suppl. No. 3) ***Juncus stygius*** L., Syst. Nat. II ed. 10 (1759) p. 987.

East Kamtchatka: Petropavlovsk Aug. 12th 1928 W. EYERDAM (Hb. Holm.). New to the flora of Kamtchatka where, it must be admitted, it is very unexpected.

Type of distribution: Eurasiatic transgressing into E. America.

Geographical area: Europe: from northern Scandinavia and Finland and Vologda prov., southwards (not confluent) to the Alps, Tirol, East Prussia and Novgorod; scattered localities in Central Russia and the southern Urals. Asia: Tobolsk prov. (Surgutsk and Tarsk districts), Tomsk prov. (Kainsk distr.) and S. Kamtchatka (the specimens from Boganida R. reported by TRAUTV. belong acc. to information given by A. TOLMATCHEW to *J. biglumis*). America: (var. *americanus*) from Newfoundland and Labrador to N. shore of Lake Superior, southwards to Minnesota, Michigan and New York.

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224. *Luzula arcuata* var. *kamtschadalorum;* add: mt. Palovinaja Aug. 1st 1928 W. Eyerdam; Korjatskaja volcano Aug. 13th 1928 W. Eyerdam.

228. *Luzula oligantha;* add: Savoiko June 10th 1928 Malaise; Mt. Palovinaja Aug. 1st 1928 W. Eyerdam; Korjatskaja volcano Aug. 14th 1927 W. Eyerdam.

Luzula pallescens; add: Hutor June 25th and July 1st 1928 W. Eyerdam; Savoiko June 27th and July 16th 1928 W. Eyerdam; Petropavlovsk June 3rd 1928 W. Eyerdam.

229. *Luzula parviflora;* add: Savoiko June 3rd 1928 Malaise.

230. Add: No. 786 (Suppl. No. 4) ***Luzula rufescens*** Fisch. in Linnaea XXII (1849) p. 385.

East Kamtchatka: Petropavlovsk June 10th 1928 W. Eyerdam; Topolovaja R., Savoiko June 3rd 1928 Malaise (both classified by G. Samuelsson).

Type of distribution: Eastern Asiatic—Western American.

Geographical area: Asia: from Tomsk Prov. and middle Yenisei (Krasnojarsk) eastwards in the north from Vilju distr. lower Lena R. and Kolyma southwards to Lake Baikal and Kamtchatka. America: Yukon R. (S. of Post at Forty mile Creek Funston 1893 No 47!).

231. *Tofieldia nutans;* add: mt. Palovinaja July 22nd 1928 Malaise, do. Aug. 1st 1928 W. Eyerdam; Ustj-Kamtchatsk July 14th 1927 Malaise. Krylov (Fl. Sib. occident. ed. II vyp. III, 1929 p. 584) reports this species also from northern Tobolsk prov.

232. *Tofieldia palustris.* Acc. to Kom. (Fl. Penins. Kamtsch. I p. 290) the plant reported by Fedtschenko as *T. palustris* belongs to *T. calyculata.*

233. *Veratrum album* subsp. *oxysepalum;* add: Karaginsk Island acc. to Mertens loc. cit.

236. Add: No. 787 (Suppl. No. 5) ***Hemerocallis Middendorffii*** Tr. & Mey., Fl. Ochot. phaenogam. (1856) p. 94.

Yabe & Yendo, Fl. Shimushu p. (177).

Northern Kuriles: Shumshu Yokoyama 1893 acc. to Yabe & Yendo loc. cit.

As this species occurs on Yezo and the southern Kuriles there is hardly any reason to doubt the correctness of this report.

Type of distribution: Asiatic Pacific.

Geographical area: The Kuriles, Yezo, Saghalin, Udskoj distr., Manchuria and Corea.

236. *Gagea lutea;* add: Pallan Longinoff acc. to Malaise in letter.

237. *Allium strictum;* add: the hot springs at Nalutcheva July 30th 1928 W. Eyerdam.

240. *Allium victorialis* subsp. *platyphyllum;* add: Pallan Longinoff 1927 acc. to Malaise in letter.

241. *Lilium davuricum;* add: Savoiko July 10th and 12th 1928 W. Eyerdam.

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243. *Fritillaria camtschatcensis;* Komarov (Fl. Penins. Kamtsch. I p. 300) reports several localities in the Central Valley.
246. *Lloydia serotina;* add: Pallan Longinoff 1927 acc. to Malaise in letter.
253. *Trillium Pallasii;* add: Sharomsk and Tolbatchik acc. to Kom., Fl. Penins. Kamtsch. I p. 306; Pallan Longinoff 1927 acc. to Malaise in letter.
255. *Iris setosa;* add: between Jelovka and Sedanka Aug. 20th 1927 Vavilin.
257. *Cypripedium macranthum;* add the synonym »*Cypripedium* sp. (*macranthum* Sw.?)» Yabe & Yendo, Fl. Shimushu p. (178).

Acc. to Yabe and Yendo loc. cit. the natives report a plant which from their description must be this species from Betsutapu in Shumshu. Yendo searched for the plant but could not find it.

258. *Cypripedium Yatabeanum;* add: Hutor July 1st 1928 W. Eyerdam; Savoiko June 28th 1928 W. Eyerdam; Komarov (Fl. Penins. Kamtsch. I p. 309) reports several localities in the Central Valley.
258. The letters under fig. 18 should be changed. The petal to the left belongs to *Cypripedium Yatabeanum* and that to the right to *C. guttatum.*
259. *Orchis aristata;* add: Savoiko July 6th 1928 W. Eyerdam; Pallan June 27th 1927 Longinoff.
262. *Gymnadenia camtschatica.* Type of distribution should be Asiatic Pacific, not Northern Pacific.
263. *Platanthera Ditmariana;* add: Krajevetcheski hot springs July 27th 1928 P. T. Novograblenof.
266. *Platanthera tipuloides;* add: Savoiko July 12th 1928 W. Eyerdam, do. Aug. 2nd 1928 Malaise.
267. *Epipactis papillosa;* add: Petropavlovsk Aug. 8th 1928 W. Eyerdam; between Sierroglaska and Avatcha acc. to Malaise in letter.
268. *Listera cordata;* add: Palovinaja R. July 22nd 1928 W. Eyerdam.
269. *Neottia micrantha;* add: between Sierroglaska and Avatcha acc. to Malaise in letter.
270. *Microstylis monophyllos;* add the synonym *Malaxis monophylla* (L.) Sw., Kom., Fl. Penins. Kamtsch. I p. 322.

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3. *Populus suaveolens;* add: Hutor June 25th 1928 W. Eyerdam; Komarov (Fl. Penins. Kamtsch. II p. 3) reports this plant from Kol, Krutugorovaja, and Oblukovina (on the western coast) and around Lake Kronoki.
6. *Salix arctica × glauca × Chamissonis*; add: mt. Palovinaja Aug. 1st 1928 W. Eyerdam; Korjatskaja volcano Aug. 14th 1928 W. Eyerdam.
7. *Salix arctica × glauca × Chamissonis × cuneata;* add: Korjatskaja volcano Aug. 12th 1928 W. Eyerdam.
7. *Salix arctica × glauca × cuneata;* add: Korjatskaja volcano Aug. 12th and 14th 1928 W. Eyerdam; the Nalutcheva pass Aug. 31st 1928 W. Eyerdam.
8. *Salix berberifolia;* add: Korjatskaja volcano Aug. 13th and 14th 1928 W. Eyerdam.

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9. *Salix Chamissonis;* add: mt. Palovinaja Aug. 1st 1928 W. Eyerdam.
10. *Salix cinerascens*; add: Savoiko Aug. 15th 1928 W. Eyerdam; Hutor June 12th 1928 Malaise.
10. *Salix cuneata;* add: Korjatskaja volcano Aug. 13th 1928 W. Eyerdam; S. of Pallan Savtchenko acc. to Kom., Fl. Penins. Kamtsch. II p. 27.
11. *Salix fuscescens;* add to the synonyms *Salix phleobophylla* Kudo, Fl. Paramush. p. 96. A photograph which I have seen of Kudo's specimens from Paramushir shows that his »*S. phleobophylla*» belongs to this species.

    Add to the localities: Paramushir: Yokoyama 1893 acc. to Kudo loc. cit., Kudo 1920. South Kamtchatka: Hutor June 29th and 30th and July 22nd 1928 W. Eyerdam; Savoiko June 27th 1928 W. Eyerdam.

    To the geographical area should be added the northern Kuriles and northern Saghalin.
12. *Salix fuscescens* × *sachalinensis;* add to the synonyms *Salix paramushirensis* Kudo, Fl. Paramush. p. 97. A photograph which I have seen of Kudo's type-specimen of this plant shows that it belongs to the above-mentioned hybrid series.

    Add to the localities: Hutor June 25th 1928 W. Eyerdam; between Savoiko and Hutor June 13th 1928 Malaise; Savoiko June 3rd and July 5th 1928 Malaise.
13. *Salix Gmelini;* add: Hutor Aug. 6th 1927 W. Everdam. Komarov (Fl. Penins. Kamtsch. II p. 18) also enumerates several localities in the Central Valley.
14. *Salix hastata* subsp. *psiloides;* add the synonym *Salix psiloides* (Flod.) Kom.
14. *Salix Hultenii;* add: mt. Palovinaja June 5th 1928 Malaise.
15. *Salix longipetiolata* was recently collected on Matswa and Shiripoi Islands (among the Kuriles) by Bergman.
16. *Salix parallelinervis.* Komarov (Fl. Penins. Kamtsch. II p. 14) enumerates many localities from the Central Valley, from Lake Kronoki, from the eastern coast between Lake Kronoki and Petropavlovsk and from Karaginsk Island.
20. *Salix rotundifolia, ovalifolia* and *phlebophylla* are reported by Kom., Fl. Penins. Kamtsch. II pp. 30—31 as collected by Mertens on Karaginsk Island. The reports are in need of confirmation.
21. On the seventh line from the end, for »*Salix arenari*» read *Salix arenaria.*
22. Kudo's »*Salix phleobophylla*» is *S. fuscescens* (compare above).
22. *Myrica gale* var. *tomentosa;* add: Hutor July 19th 1928 Malaise; Ushki Protopopof 1909 acc. to Kom., Fl. Penins. Kamtsch. II p. 36.
29. *Betula exilis;* add: Savoiko July 3rd 1928 W. Eyerdam.
34. *Alnus fruticosa;* Komarov, Fl. Penins. Kamtsch. II p. 49 enumerates several additional localities in western and northern Kamtchatka.
39. *Alnus hirsuta;* add: Hutor June 27th 1928 W. Eyerdam. Komarov, Fl. Penins. Kamtsch. II p. 51 enumerates several localities along the western coast northwards to Tigil.

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44. *Rumex aquaticus;* Komarov, Fl. Penins. Kamtsch. II p. 60 enumerates localities in the Central Valley and at Lake Kronoki.

50. *Polygonum amphibium;* add: Hutor Sept. 6th 1928 Malaise; Lake Mashura acc. to Kom., Fl. Penins. Kamtsch. II p. 66.

54. *Polygonum Pawlowskianum* should acc. to Steward (Contr. Gray Herb. LXXXVIII p. 102) be named *P. tripterocarpum* A. Gray in Rothr. Ann. Rep. Smiths. Inst. 1867 p. 453 (1868).

55. Add: *Polygonum Weyrichii* F. Schm. was reported by Steward loc. cit. p. 103 as having been collected in Kamtchatka by Seeman. Otherwise it is not known to me north of Shinshir Island (the central Kuriles).

58. *Atriplex Gmelini;* add: Petropavlovsk July 20th and Aug. 10th 1928 W. Eyerdam; the mouth of Koronevski R. acc. to Kom., Fl. Penins. Kamtsch. II p. 72.

63. *Stellaria calycantha;* add: mt. Palovinaja July 14th 1928 Malaise.

64. *Stellaria calycantha* × *Fenzlii:* since I wrote the first part of this flora I have seen more material of the plant in question and I must admit that the type is more constant than could be expected of a hybrid. It is possible that Komarov is right in regarding it as a separate species *S. lancifolia* Kom.

68. *Stellaria longifolia;* add: Petropavlovsk July 10th 1928 Malaise.

69. *Stellaria radians.* Komarov, Fl. Penins. Kamtsch. II p. 81 reports several localities in the central Valley at Lake Kronoki and along the eastern coast between Lake Kronoki and Petropavlovsk.

73. *Cerastium Fischerianum. Cerastium Fischerianum* has practically always been misunderstood. It seems that already Chamisso, who two years after the publication of *C. Fischerianum* described a plant under that name in Linnaea I, misinterpreted the plant, and most other authors after him have done the same. The type specimen in Herb. De Candolle, Geneva, of which I have got a photograph, shows that it is the plant which I have called *C. unalaschkense* that is the true *C. Fischerianum.* The type specimen (fig. 19) is provided with two labels viz. »*Cerastium hirsutum* m. e Kamtschatka. Merk, Magnos & laxos caespites efformat. Fructum maturum non vidi. An *C. piloso* Ledeb. affine? Ms. Fischer 1819» and »*C. Fischerianum* Ser. *C. hirsutum* Fisch.». Consequently, the plant named by me *C. Fischerianum* var. *Beeringianum* should be named *C. Beeringianum* Cham. & Schlecht., and the plant I named *C. Fischerianum* should be regarded as a non-glandular variety of *C. Beeringianum.*

71. *Cerastium unalaschkense* Takeda is apparently identical with ***C. Fischerianum*** Sér. and should be so named. Compare above.

77. *Sagina Linnaei;* add: Savoiko Aug. 2nd 1928 Malaise.

78. *Sagina litoralis.* Prof. Nakai has kindly pointed out to me that this plant is in his opinion identical with *S. crassicaulis* Wats., Proc. Amer. Acad. 18 (1883) p. 191. Nakai has discussed the subject in an article



Fig. 19. *Cerastium Fischerianum* SÉR. Type specimen in Hb. DE CANDOLLE, Geneva. (Somewhat less than natural size.)

(in Japanese) in Bot. Mag. Tokyo 38 (1924) p. (230). A fragment of WATSON's type-specimen as well as several other specimens of *S. crassicaulis* were kindly sent to me by Prof. FERNALD. The American *S. crassicaulis* has glabrous pedicels while *S. litoralis* has glandular pedicels. Otherwise the two forms are in fairly close agreement with one another. The study of a larger body of material may result in *S. litoralis* being regarded as a race of *S. crassicaulis*. *S. crassicaulis* is distributed along the coast from the Aleutian Islands and southern Alaska to California.

79. *Minuartia arctica;* add: the mouth of Itcha R. BJELOUSSOF 1914.

82. *Minuartia macrocarpa.* To the geographical area should be added one locality on Nova Zembla (Compare the map given by MATTFELD in Pflanzenareale Reihe 2 Heft 6 Karte 61).

83. *Honckenya peploides* var. *major.* KOMAROV (Fl. Penins. Kamtsch. II p. 97) reports this plant from Kichtchik and Kolpakovaja on the western coast and from the eastern coast between Lake Kronoki and Petropavlovsk.

85. *Moehringia lateriflora.* KOMAROV, Fl. Penins. Kamtsch. II p. 95 enumerates several localities in the Central Valley and on the eastern coast between Lake Kronoki and Petropavlovsk.

89. *Silene acaulis;* add: Mt. Ganalski Vystraki acc. to P. T. NOVOGRABLENOF in Izv. Russk. Geogr. Obsch. LVII (1925) p. 109.

92. *Melandryum apetalum;* add: Kashkan R. acc. to KOM. (Fl. penins. Kamtsch. II p. 104).

94. *Dianthus repens;* add: the hot spring at Nalutcheva R. July 30th 1928 W. EYERDAM.

95. *Caltha palustris.* KOMAROV (Fl. Penins. Kamtsch. II p. 112) enumerates several localities in the Central Valley and along the eastern coast between Lake Kronoki and Petropavlovsk.

100. *Coptis trifoliata;* add: the Kronoki Pass, Uzon and Kichpinitch acc. to KOM. (Fl. Penins. Kamtsch. II) p. 116.

102. *Cimicifuga simplex.* Localities enumerated by KOMAROV (Fl. Penins. Kamtsch. II p. 119) widen the area northwards to Kol (W. coast), Sharomsk (Centr. Valley) and Semjatchik (E. coast).

104. *Delphinium pauciflorum* acc. to KOMAROV (Fl. Penins. Kamtsch. II p. 122) occurs on Bering Island. It is, however, not clear from the text that he has controlled the specimens.

110. *Anemone debilis;* add: Savoiko June 2nd 1928 MALAISE.

112. *Anemone narcissiflora;* add: Mt. Palovinaja July 22nd 1928 MALAISE, do. Aug. 1st 1928 W. EYERDAM.

114. *Anemone nemorosa* subsp. *amurensis;* add: Savoiko June 2nd 1928 MALAISE.

117. *Pulsatilla angustifolia;* add: Pallan LONGINOFF 1927 acc. to MALAISE in letter.

120. *Ranunculus acer* subsp. *japonicus.* The synonym *Ranunculus japonicus* THUNB. in Transact. Linn. Soc. II (1794) p. 337 should be excluded. The type specimen in Hb. Thunberg, which I have seen, is a fairly different

plant. Our plant was, however, included in var. *japonicus* by MAXIMOWICZ himself, who when describing var. *japonicus* enumerates inter alia Kamtchatka as the home of that plant. It may thus bear the name *R. acer* var. *japonicus* MAXIM. until a critical revision of the Asiatic *R. acer*forms appears. It is perhaps better to refer the plant to var. *frigidus* RGL. et MAAK as KOMAROV does.

121. *Ranunculus aquatilis;* add: Savoiko Aug. 5th 1928 MALAISE, do. Aug. 28th 1928 W. EYERDAM; between Petropavlovsk and Savoiko July 26th 1928 W. EYERDAM; KOMAROV (Fl. Penins. Kamtsch. II pp. 135, 136) reports several localities in the Central Valley.

124. *Ranunculus Eschscholtzii;* add: mt. Palovinaja July 22nd 1928 MALAISE, do. Aug. 1st 1928 W. EYERDAM; Bering Island leg. KULAGINA 1928 (Hb. Holm.); KOMAROV (Fl. Penins. Kamtsch. II p. 140) describes a new variety var. *asiatica* of this species. Before the many puzzling forms which occur in America are cleared up it is of little use to distinguish the Asiatic plant as a separate form.

125. *Ranunculus Gmelini;* add: Hutor June 27th 1928 MALAISE.

126. *Ranunculus hyperboreus;* add: Savoiko July 28th 1928 MALAISE.

127. Add: No. 788 (Suppl. No. 6) ***Ranunculus nivalis*** L., Sp. pl. ed. I (1753) p. 553.

South Kamtchatka: Savoiko, mt. Palovinaja July 22nd 1928 MALAISE, do. Aug. 1st 1928 W. EYERDAM.

R. nivalis, *R. sulphureus* var. *intercedens*, *R. Eschscholtzii* and *R. pygmaeus* form a critical group in Kamtchatka. The material in my hands at the final revision of Part II of this flora contained no specimens of *R. nivalis*, but as I was not at that time aware that it existed within our area specimens belonging to it may be found in the material from Russian museums enumerated under *R. sulphureus* var. *intercedens*.

The specimens of *R. nivalis* from mt. Palovinaja has a completely naked receptacle and the size and form of the carpels as well as the form of the radical leaves agree well with the corresponding parts of the Scandinavian plant. It may be remarked that the receptacle of *R. sulphureus* var. *intercedens* is often less hairy than that of the headform, or hairy only at the base and at the top but naked in the middle part. The material of the above-mentioned critical group I have divided thus.

a Sepals densely black or dark-brown hairy
  b Receptacle naked — *R. nivalis*
  bb Receptacle brown-hairy, especially at the base and at the top. — *R. sulphureus* var. *intercedens*
aa Sepals glabrous or with some few yellowish hairs
  c Peduncles glabrous, flowers comparatively large, about 1 cm. in diameter — *R. Eschscholtzii*
  cc Peduncles hairy flowers small — *R. pygmaeus*

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R. sulphureus var. *intercedens* is very variable and one might suspect that it is of hybrid origin. Also *R. Eschscholtzii* is very variable as already pointed out in this work. Acc. to information kindly given me by St. John in a letter *R. Suksdorffii*, *R. Eschscholtzii* and *R. verecundus* cannot be specifically distinguished from each other in W. America as all intermediate forms between them exist.

The line of demarcation between the smallest-flowered forms of *R. Eschscholtzii* and *R. pygmaeus* is also very indistinct and hybrid forms between them certainly exist.

Type of distribution: Circumpolar.

Geographical area: Europe: from Iceland, Spitzbergen and Nova Zembla southwards to Central Scandinavia (in the mts.) and the arctic Russian mainland. Asia: along the Arctic Coast to Chukch Penins. southwards to S. Kamtchatka. America: from Alaska and the Arctic Archipelago southwards to Alberta. W. and E. Greenland.

128. *Ranunculus repens;* add: Hutor Aug. 6th 1928 W. Eyerdam; Savoiko Aug. 2nd 1928 Malaise.

129. *Ranunculus reptans;* add: Hutor July 19th 1928 W. Eyerdam; Golygina Peters and Lake Natchika Kom. both acc. to Kom., Fl. Penins. Kamtsch. II p. 141.

130. No. 789 (Suppl. No. 7) ***Ranunculus subsimilis*** Printz, Veg. Sib.-Mong. Front. (1921) p. 236.

East Kamtchatka: Petropavlovsk by the lake July 8th 1928 W. Eyerdam; Shartchina Dybovsky acc. to Kom. loc. cit. p. 149.

The early report of this plant from Kamtchatka has been confirmed by Eyerdam.

Type of distribution: ?

Geographical area: the area of this plant can-not be stated with any degree of certainty before its relationship to *R. Cymbalaria* var. *alpinus* Hook. and to *R. Kawakamii* Mak. (which I have not seen) is cleared up. In any case it is a Siberian plant occurring from Persia to Kamtchatka, possibly also in North America.

133. *Thalictrum alpinum;* add: the Penishivo Pass July 28th 1928 W. Eyerdam.

137. *Thalictrum sparsiflorum;* add: Savoiko July 31st 1928 W. Eyerdam.

141. *Papaver alboroseum;* add: the Penishivo Pass Aug. 2nd 1928 W. Eyerdam.

141. *Papaver microcarpum;* add: Korjatskaja volcano Aug. 14th 1928 W. Eyerdam.

142. *Corydalis ambigua;* add: Savoiko June 12th 1928 Malaise.

144. *Corydalis pauciflora;* add: Pallan Longinoff acc. to Malaise in letter.

146. *Cochlearia officinalis;* add: Kolpakovaja (western coast) Zelenin acc. to Kom., Fl. Penins. Kamtsch. II p. 165.

153. *Cardamine pratensis;* add: Hutor June 30th 1928 Malaise; Savoiko June 8th 1928 Malaise.

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155. *Cardamine Regeliana.* Komarov (Fl. Penins. Kamtsch. II p. 177) enumerates localities also from the Central Valley.

156. *Cardamine tenuifolia;* add: South Kamtchatka: Savoiko June 2nd and 8th 1928 W. Eyerdam; mt. Palovinaja June 2nd 1928 Malaise.

162. *Draba kamtschatica;* add: Nikolajevsk »Podpruginski pad» Aug. 26th 1928 Malaise; Mt. Palovinaja July 22nd 1928 W. Eyerdam.

164. *Draba ussuriensis.* Pohle in Fedde, Rep. Spec. Nov. Beiheft Bd. XXXII 1925 p. 34 reports this plant from »Kamtchatka» (Herb. Turz.) at the same time he says that it probably belongs to Redowskys' plants collected at Ochotsk. In Fl. Penins. Kamtsch. II p. 186 Komarov says that no Kamtchatka plants were present in Turczanninov's herbarium, but this is actually the case.

172. *Erysimum hieracifolium;* add: Pallan Savtchenko acc. to Kom., Fl. Penins. Kamtsch. II p. 192.

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5. *Drosera rotundifolia;* add: Hutor July 5th 1928 W. Eyerdam; Central Kamtchatka Kirganik acc. to Kom., Fl. Penins. Kamtsch. II p. 196.

9. *Sedum Telephium* var. *purpureum.* Komarov (Fl. Penins. Kamtsch. II p. 202) reports this plant from several localities in the Central Valley and along the eastern coast between Lake Kronoki and Petropavlovsk.

10. *Sedum verticillatum;* add: Sharomsk acc. to Kom., Fl. Penins. Kamtsch. II p. 199.

13. *Saxifraga bronchialis* subsp. *Funstonii;* add: Korjatskaja volcano Aug. 14th 1928 W. Eyerdam.

20. *Saxifraga fusca.* Komarov (Fl. Penins. Kamtsch. II p. 211, sub *S. purpurascens*) reports this plant from the region about Paratunka, Natchika and Kronoki Pass.

22. *Saxifraga Merkii.* Krascheninnikof's report of this species from Paramushir should be excluded; Komarov (Fl. Penins. Kamtsch. II p. 215) reports that the plant was collected at Ljesnaja Bay (Western Coast) 59° 25′ N lat. by Bjeloussof.

24. *Saxifraga oppositifolia* subsp. *asiatica;* add: the Ganala mts. Rieder 1831 acc. to Kom., Fl. Penins. Kamtsch. II p. 219.

32. *Chrysosplenium kamtschaticum.* Komarov (Fl. Penins. Kamtsch. II p. 221) reports several localities from the Eastern Coast and the Central Valley northwards to about Lake Kronoki, the area of the species thus being widened considerably northwards.

50. *Rubus arcticus.* Komarov (Fl. Penins. Kamtsch. II p. 240) enumerates a great many of localities in the Central Valley along the Eastern and also along the Western Coast connecting the northern and the southern groups on my map p. 188.

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54. *Rubus idaeus* subsp. *sachalinensis;* add: Hutor July 1st 1928 W. Eyerdam.
59. *Potentilla fruticosa;* add: the synonym *Dasiphora fruticosa* Kom., Fl. Penins. Kamtsch. II p. 244 and the locality Hutor June 25th 1928 W. Eyerdam.
63. *Potentilla pacifica;* add: Savoiko July 17th 1928 W. Eyerdam.
64. *Potentilla palustris;* add: Uka Skobunov 1920; Karaginsk Island Skobunov 1920, both acc. to Kom., Fl. Penins. Kamtsch. II p. 254. Komarov also enumerates several localities along the eastern coast between Lake Kronoki and Petropavlovsk.
66. *Potentilla stolonifera;* add: Savoiko July 12th 1928 W. Eyerdam.
70. *Sibbaldia procumbens;* add: Korjatskaja volcano Aug. 14th 1928 W. Eyerdam.
72. *Geum macrophyllum;* add: Hutor W. Eyerdam 1928; In Fl. Penins. Kamtsch. II p. 258 Komarov supposes this to be a sea-shore plant. This is by no means the case.
73. *Geum pentapetalum.* Komarov (Fl. Penins. Kamtsch. II p. 258) reports this plant from Malka and Haliger. The area of this species is thus slightly wider towards the northeast than is shown on the map p. 192.
76. *Geum strictum.* Komarov (Fl. Penins. Kamtsch. II p. 257) reports this plant from Bering Island.
78. *Dryas octopetala;* add: Korjatskaja volcano Aug. 13th 1928 W. Eyerdam.
92. *Prunus Padus;* add: Apatcha and Bannaja acc. to Kom., Fl. Penins. Kamtsch. II p. 271.
96. *Trifolium repens;* add: Savoiko Aug. 12th 1928 W. Eyerdam.
96. *Astragalus alpinus;* add: Savoiko July 27th 1928 W. Eyerdam; Topolovaja R. June 8th 1928 Malaise.
100. *Astragalus oroboides.* Komarov reports this species from Ploskaja volcano and from Pallan. I have seen only the specimen from Ploskaja volcano collected by Protopopof, which in my notes I have designed as *A. alpinus.*
100. *Astragalus Schelichowii;* add: Savoiko July 27th 1928 Malaise; Topolovaja R. June 8th 1928 Malaise.
103. *Oxytropis erecta;* Kom. (Fl. Penins. Kamtsch. II p. 286) reports this plant also from Vahil R. and from Karaginsk Island.
109. Line 17, for *rubricaulis* read *rubricaudex.*
109. *Oxytropis revoluta;* add: mt. Palovinaja Aug. 1st 1928 W. Eyerdam. Komarov (Fl. Penins. Kamtsch. II p. 282) reports this species also from Chukch Penins.
115. *Lathyrus palustris* var. *pilosus;* add: Savoiko July 18th 1928 W. Eyerdam. Komarov (Fl. Penins. Kamtsch. II p. 292) reports it from Kompakovaja and Napana on the western coast, from several localities in the Central Valley and along the eastern coast northwards to Ozernaja (about 57° 30′ N. lat.).
117. *Geranium erianthum.* Komarov (Fl. Penins. Kamtsch. II p. 294) reports this plant from several localities along the eastern coast northwards to Ozernaja and from Pallan.

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120. Add: No. 790 (Suppl. No. 8) ***Oxalis Acetosella*** L., Sp. pl. ed. I (1753) p. 433.

Central Kamtchatka: Valley of Kireun R. Aug. 19th 1929 acc. to P. T. Novograblenof in letter; Jelovka June 29th 1929 acc. to P. T. Novograblenof in letter.

This plant is new to the flora of Kamtchatka.

Type of distribution: ?

Geographical area: Europe: from Faroe Islands, northern Sweden, central Finland and Perm prov. southwards to Spain, Italy and Caucasus. Asia: at Obi from Tjumen distr., at Yenisei from about Lower Tunguska, from Jablonoj mts., Udskoj distr., Saghalin and the southern Kuriles, southwards to the Himalayas and northern China, also in N. Kamtchatka. America: from Nova Scotia, Ontario and Saskatchewan, southwards in the mts. to N. Carolina. Also in N. Africa.

122. *Callitriche verna.* In Bull. Jard. Bot. URSS T. XXVII: 3 (1928) p. 358—362 Petrov describes some new species of *Callitriche*, of which, acc. to Kom., Fl. Penins. Kamtsch. II pp. 299, 300, three, viz. *C. subanceps*, *C. elegans* and *C. fallax*, are found in Kamtchatka. Prof. Samuelsson who has kindly revised my material of *Callitriche* from Kamtchatka, writes on this question: »The only material determined by Petrov himself that I have seen is one specimen (Hn No. 2513) of *C. subanceps* (det. V. Petrov 14/5 1928). That specimen in no way differs, however, from common European forms of *C. verna*. A review of the material collected by Hultén has shown that Hn Nos. 1773 and 2949, which were referred by Petrov to *C. verna* should according to the description given by him rather be taken to *C. elegans*. The difference from *C. verna* is, however, very slight and confined to somewhat larger bracts and unusual long stigmata. The form and size of the fruit show no characteristics contrary to *C. verna*, and so far as I can see the whole material should be referred to this widespread and therefore very multiform species. The description of *C. fallax* does not include anything indicating that it should be better distinguished from *C. verna* than the others».

126. *Hypericum Gebleri;* add: near Savoiko Aug. 27th and 28th 1928 W. Eyerdam.

131. *Viola crassicornis:* add: Savoiko June 5th 1928 Malaise.

131. *Viola epipsila* subsp. *repens;* Komarov (Fl. Penins. Kamtsch. II p. 308) enumerates this plant from Pallan and Karaginsk Island and from several localities around Lake Kronoki and along the eastern coast from Lake Kronoki to Petropavlovsk.

133. *Viola epipsila* was recently reported also from Iceland.

137. *Viola Langsdorffii;* add: mt. Palovinaja July 14th 1928, W. Eyerdam.

138. *Viola Selkirkii;* add: Savoiko June 25th, July 1st, 4th, 8th and 14th 1928 W. Eyerdam; mt. Palovinaja July 14th 1928 W. Eyerdam.

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140. *Daphne kamtschatica;* add: Savoiko June 8th 1928 W. Eyerdam; the hot springs at Nalutcheva R. July 31st 1928 W. Eyerdam.

141. Add: *Eleagnaceae:* ***Hippophae rhamnoides.*** In his monograph on the family *Eleagnaceae* Servettaz reports this plant from Kamtschatka (Bot. Centralbl. XXV: 2, 1909, Beiheft p. 11).

As source he gives »F. Höck, Pflanzengeogr.» Höck reports the plant from Kamtchatka in a referat of Hemsley & Pearson, The flora of Tibet and high Asia which he gives in Just's Bot. Jahresber. 30: 1 (1902) p. 496. Hemsley & Pearson, however, only reports it from »Siberian region». *H. rhamnoides* must in any case be excluded from the flora of our area. It is not known to grow wild east of Transbaikalia although maps are sometimes found (for inst. in Servettaz loc. cit. and in Hegi, Ill. Fl. Mitt. Europ. V: 2 p. 734) in which this species is indicated not only in Kamtchatka but also in Manchuria and Japan.

145. *Epilobium glandulosum.* As already pointed out the material referred to *E. glandulosum* is not quite uniform. It is therefore possible that the three numbers enumerated as representing a somewhat different type belong to the new species described by Komarov (Fl. Penins. Kamtsch. II p. 324) as *E. bifarium.* This seems as much the more probable as two of the three specimens enumerated by Komarov as belonging to his new species originate from Petropavlovsk. Without access to Komarov's specimens it is, however, not possible to form a definite opinion about the case, especially as it is not clear from the description how the new species differs from the certainly very multiform *E. glandulosum.*

145. Line 8 from the end add: Petropavlovsk July 23rd 1920 Hn No. 563.

146. Line 6: instead of 503 read 503 a and instead of 593 b read 539 b.

146. *Epilobium Hornemanni;* add: Petropavlovsk 1928 W. Eyerdam.

148. *Epilobium palustre;* add: Savoiko July 28th 1928 W. Eyerdam.

149. *Epilobium sertulatum;* add: Savoiko July 15th 1928 Malaise; Petropavlovsk July 8th 1928 W. Eyerdam; Avatcha volcano Aug. 25th 1928 W. Eyerdam.

151. *Circaea alpina;* add: Nikolajevsk, »Podpruginski pad» Aug. 26th 1928 Malaise; Savoiko July 31st and Aug. 28th 1928 W. Eyerdam.

152. *Hippuris tetraphylla;* add: Petropavlovsk July 8th 1928 W. Eyerdam; Karaginsk Island Kanakin 1928 acc. to Kom., Fl. Penins. Kamtsch. II p. 331.

157. *Bupleurum triradiatum;* add: mt. Palovinaja July 29th 1928 W. Eyerdam; the hot springs at Nalutcheva R. Aug. 1st 1928 W. Eyerdam; Komarov (Fl. Penins. Kamtsch. II p. 337) reports this plant from Vojampolka, Pallan and Karaginsk Island, all in N. Kamtchatka.

158. *Cicuta virosa;* add: Petropavlovsk July 26th 1928 W. Eyerdam; Karaginsk Island Kanakin 1918 Acc. to Kom., Fl. Penins. Kamtsch. II p. 338.

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164. *Ligusticum mutellinoides* Kom., Fl. Penins. Kamtsch. II p. 342 reports this plant also from Ploskaja volcano, »Pervaja na dolu sopotchka» collected by Protopopof.

165. *Ligusticum scoticum.* Acc. to Fernald (Rhodora 32, 1930, p. 7) the Pacific plant differs in several important respects from the Atlantic. Our plant should thus be regarded as a separate species ***Ligusticum Hultenii*** Fern.; Komarov, Fl. Penins. Kamtsch. II p. 343 reports this plant also from Karaginsk Island.

167. *Angelica genuflexa;* Karaginsk Island Kanakin 1928 acc. to Kom., Fl. Penins. Kamtsch. II p. 345.

169. *Angelica ursina;* acc. to Novograblenof (Izv. Russk. Geogr. Obsch. LVII (1925) p. 105) this plant is not rare about Malka.

175. *Cornus suecica;* add: Klutchevskaja volcano Kurtashof 1909 acc. to Kom., Fl. Penins. Kamtsch. II p. 349; Komarov further enumerates several localities along the eastern coast northwards to Ozernaja (about 50° 30′ N. lat.) and from Kishtchik, Nemtik and Napana on the western coast.

195. *Rosa acicularis;* a plus should be added at the northern edge of the map as Komarov (Fl. Penins. Kamtsch. II p. 271) reports the plant from the peninsula Taigonos.

199. *Oxytropis revoluta;* a plus should be added at the northern edge of the map as Komarov (Fl. Penins. Kamtsch. II p. 282) reports it from Chukch Penins.

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(Of the plants found in Kamtchatka the following groups were not dealt with in this work: *Pteridophyta, Monocotyledonae, Callitrichaceae, Crassulaceae, Geraniaceae, Leguminosae, Onagraceae, Saxifragaceae* and *Umbelliferae*.).

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This work contains a compiled list of plants from Ochotsk and Kamtchatka without any note as to which of those two countries they occur in. I have not cited this list as it does not in any way contribute towards the comprehension of the flora of our area and as it is completely lacking in scientific value. The same applies the chapter dealing with the vegetation. Botanically the most valuable part of SLJUNIN's work is the large bibliographical index found at the end of the second volume.

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Explanation of plates.

The specimens illustrated here belong to the Swedish State Museum of Natural History, Stockholm. The photographs reproduced were taken by myself.

Plate 1.

a, b, c. Capsules of *Bryanthus Gmelini* D. DON (Enlarged ten times).
d, e. Flower of *Bryanthus Gmelini* D. DON. (Enlarged ten times).
f, g, h. Nutlets of *Mertensia kamtschatica* (TURCZ.) DC. (*f, g.* from the inner side, *h.* from the outer side all enlarged five times).
i. Nutlet of *Mertensia paniculata* (AIT.) DON (Hudson Bay leg. BURKE). (Enlarged five times).
j. Nutlet of *Mertensia rivularis* (Fl. Ajan. No. 218). (Enlarged five times).
k, l. Flowers of *Pedicularis eriophora* from Kamtchatka (Twice natural size).
m, n. Flowers of *Pedicularis Chamissonis* from Kamtchatka (Twice natural size).

Plate 2.

Phyllodoce aleutica (SPRENG.) HELLER Photograph taken W. of Sholtovskaja volcano, Kamtchatka.

Plate 3.

Pentstemon frutescens LAMB. Photograph taken on Avatcha volcano, Kamtchatka.

Plate 4.

a. *Saussurea oxyodonta* HULTÉN. The specimen reproduced is HN No. 4282.
b. *Arctostaphylus alpina* (L.) SPR. var. *japonica* (NAKAI) HULTÉN. The specimen reproduced is HN No. 1064.
c, d. *Polemonium humile* WILLD. (*c.* Korjatskaja volcano leg. EYERDAM; *d.* HN No. 607). All about half natural size.

Plate 5.

a, b. *Campanula dasyantha* M. á BIEB. The specimens reproduced are HN No. 2288.
c. *Pedicularis Adamsii* HULTÉN. Type specimen from Balaganach, lower Lena R. leg. N. H. NILSSON-EHLE.
d, e, f. *Pedicularis eriophora* TURCZ. (*d, e.* HN No. 4018, *f.* HN No. 695). All about half natural size.

Plate 6.

a. Senecio Malaisei HULTÉN. Type specimen MALAISE No. 322.
b, c, d. Aster consanguineus LEDEB. (*b* MALAISE No. 350; *c, d.* HN No. 4183).
e, f. Arnica Lessingii GREENE (*e* the specimen from Klutchevskaja volcano collected by MALAISE: f. MALAISE No. 337).
g. Artemisia ursorum HULTÉN. Type specimen HN No. 677.
All about half natural size.

Tryckt den 20 oktober 1930.

Uppsala 1930. Almqvist & Wiksells Boktryckeri-A.-B.



599. *Pyrola chlorantha*



600. *Pyrola media*



601. *Pyrola minor*



602. *Pyrola rotundifolia* var. *incarnata*



603. *Pyrola secunda*



604. *Pyrola uniflora*



605. *Ledum palustre* subsp. *decumbens*



606. *Rhododendron chrysanthum*



607. *Rhododendron kamtschaticum*
● subsp. *typicum* and
◉ subsp. *glandulosum*



608. *Loiseleuria procumbens*



609. *Phyllodoce aleutica*



610. ● *Phyllodoce coerulea* and ○ *aleutica*
× *coerulea*



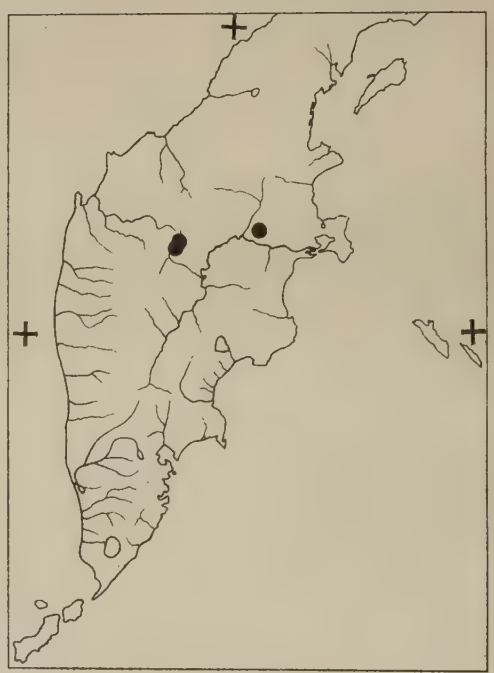
611. *Bryanthus Gmelini*



612. *Cassiope lycopodioides*



613. *Cassiope Stelleriana*



614. *Cassiope tetragona*



615. *Andromeda polifolia*



616. *Arcterica nana*



617. *Chamaedaphne calyculata*



618. *Arctostaphylos alpina*



619. *Vaccinium ovalifolium*



620. *Vaccinium præstans*



621. *Vaccinium uliginosum.*



622. *Vaccinium Vitis Idæa*



623. *Oxycoccus microcarpus*



624. *Oxycoccus quadripetalus*



625. *Diapensia lapponica* var. *obovata*



626. *Primula cuneifolia*



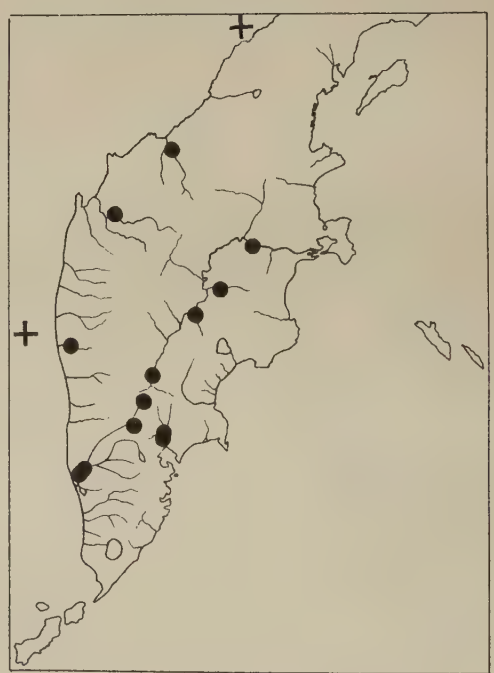
627. *Primula eximia*



628. *Primula farinosa*



629. *Primula nivalis*



630. *Androsace filiformis*



631. *Androsace Lehmanniana*



632. *Androsace septentrionalis*



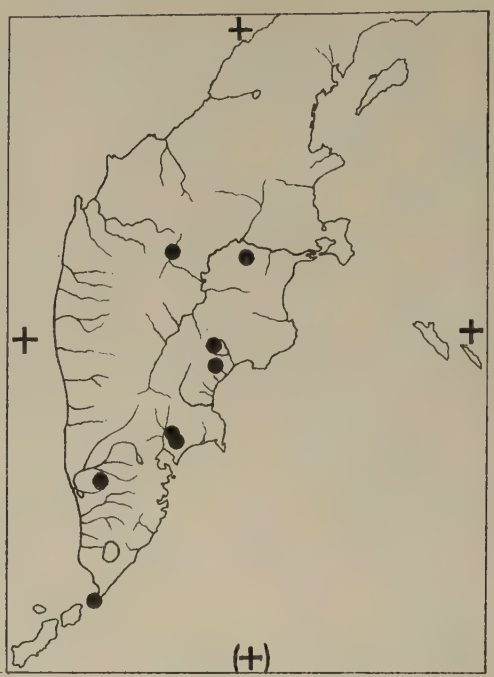
633. *Lysimachia thyrsiflora*



634. *Trientalis europæa* subsp. *arctica*



635. *Armeria vulgaris*



636. *Gentiana algida*



637. *Gentiana auriculata*



638. *Gentiana glauca*



639. *Gentiana prostrata*



640. *Gentiana tenella*



642. *Lomatogonium carinthiacum*



643. *Lomatogonium rotatum*



644. *Swertia tetrapetala*



645. *Halenia corniculata*



646. *Menyanthes trifoliata*



647. *Polemonium acutiflorum*



648. *Polemonium humile*



649. *Lappula deflexa*



650. *Lappula echinata*



651. *Eritrichium pectinatum*



652. *Eritrichium villosum*



653. *Plagiobotrys orientalis*



654. *Myosotis alpestris* subsp. *asiatica*



655. *Myosotis laxa*



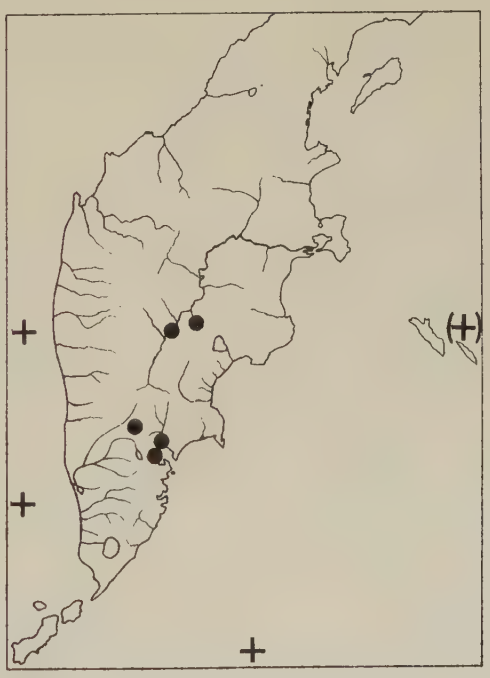
656. *Mertensia kamtschatica*



657. *Mertensia maritima* subsp. *asiatica*



658. *Mertensia rivularis*



659. *Scutellaria galericulata*



660. *Prunella vulgaris*



661. *Galeopsis bifida*



662. *Lamium album* var. *petiolatum*



663. *Stachys Riederi*



664. *Thymus serpyllum*



665. *Lycopus uniflorus*



666. *Mentha arvensis*



667. *Pentstemon frutescens*



668. *Limosella aquatica*



669. *Veronica americana*



670. *Veronica grandiflora*



671. *Veronica humifusa*



672. *Veronica scutellata*



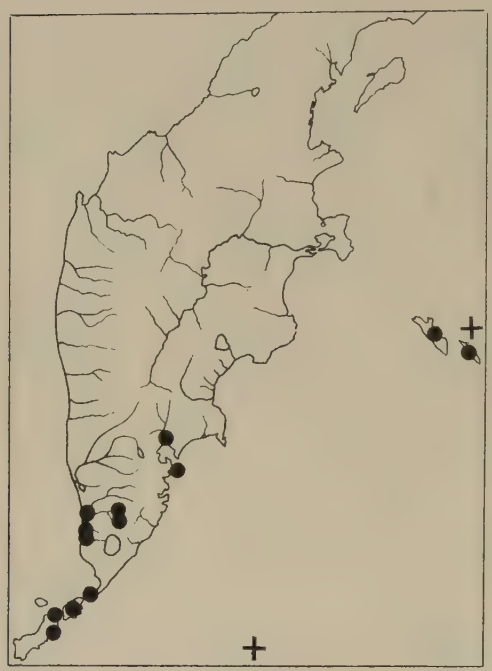
673. *Veronica Stelleri*



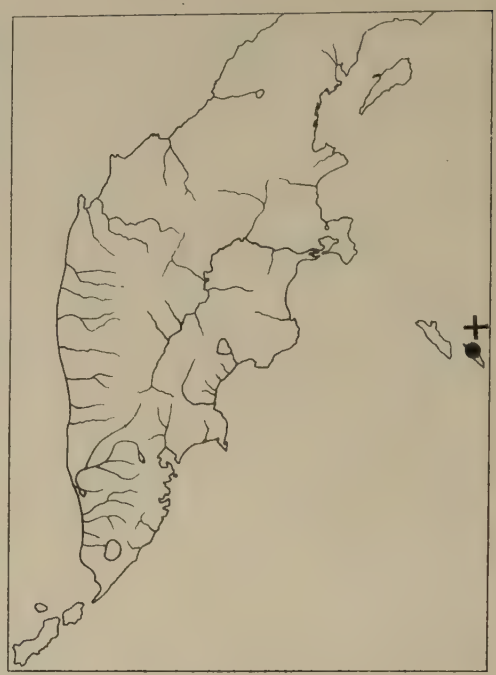
674. *Lagotis glauca*



675. *Castilleja pallida*



676. *Euphrasia mollis*



677. *Rhinanthus groenlandicus*



678. *Pedicularis capitata*



679. *Pedicularis Chamissonis*



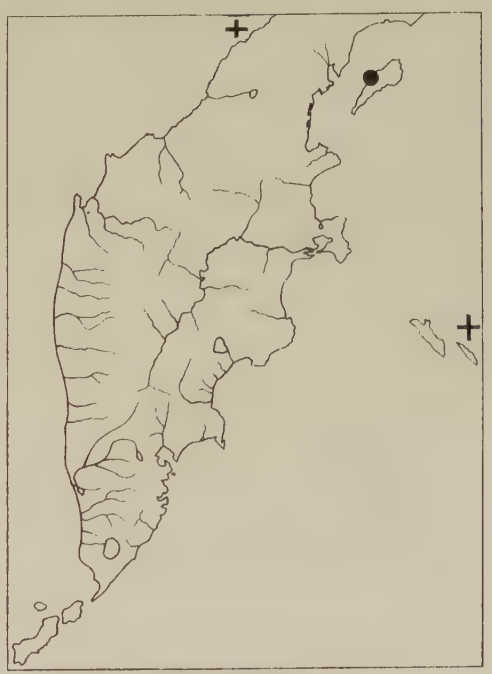
680. *Pedicularis eriophora*



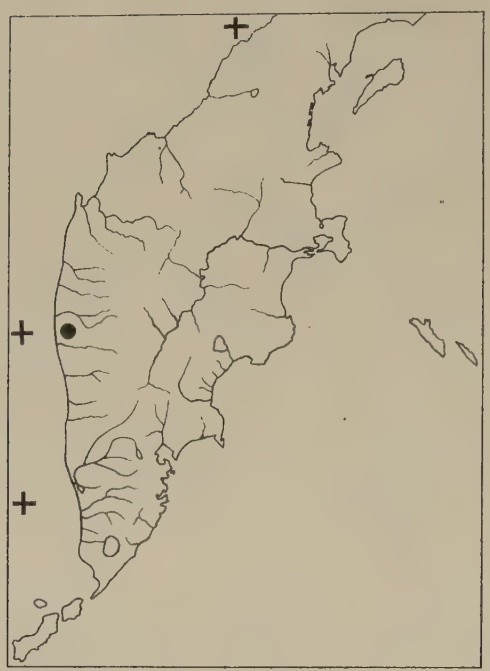
681. *Pedicularis euphrasioides*



682. *Pedicularis lanata*



683. *Pedicularis Langsdorffii*



684. *Pedicularis lapponica*



685. *Pedicularis Oederi*



686. *Pedicularis resupinata*



687. *Pedicularis Rubinskii*



688. *Pedicularis sudetica*



689. *Pedicularis verticillata*



690. *Boschniakia rossica*



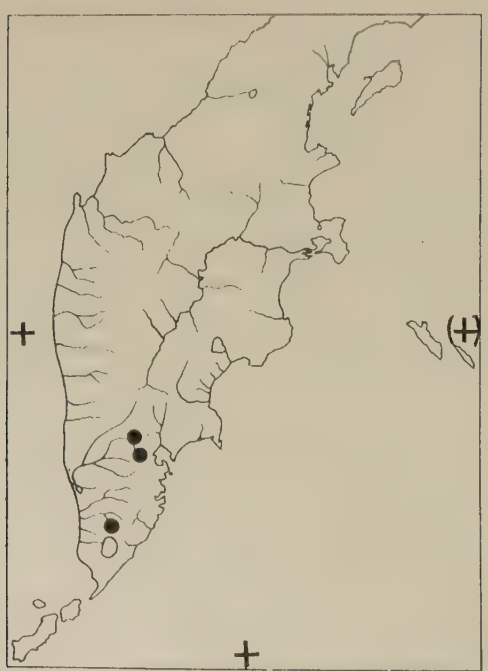
691. *Pinguicula villosa*



692. *Pinguicula vulgaris*



693. *Utricularia intermedia*



694. *Utricularia minor*



695. *Utricularia vulgaris*



696. *Plantago camtschatica*



697. *Plantago macrocarpa*



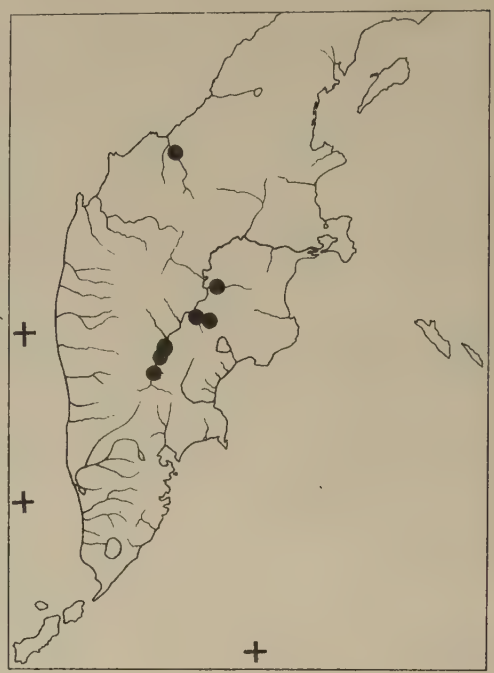
698. ● *Plantago major* and ○ var. *micrantha*



699. *Galium boreale*



700. *Galium kamtschaticum*



701. *Galium ruthenicum*



702. *Galium trifidum*



703. *Galium triflorum*



704. *Sambucus racemosa* subsp. *kamtschatica*



705. *Linnaea borealis*



706. *Lonicera Chamissoi*



707. *Lonicera coerulea* subsp. *edulis*



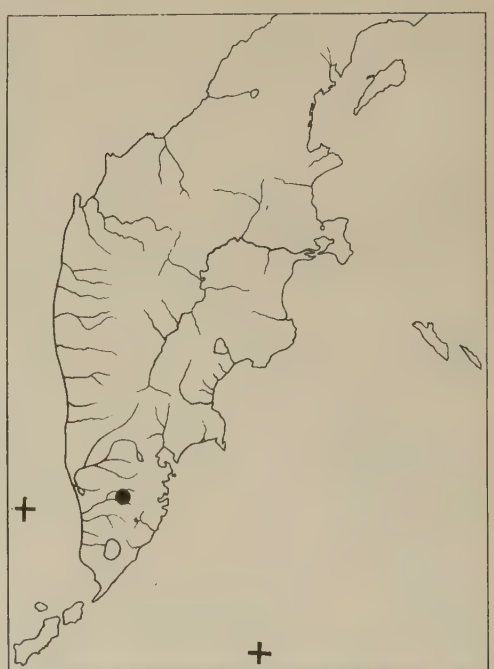
708. *Valeriana capitata*



709. *Campanula dasyantha*



710. *Campanula lasiocarpa*



711. *Peracarpa carnosa*



712. *Lobelia sessilifolia*



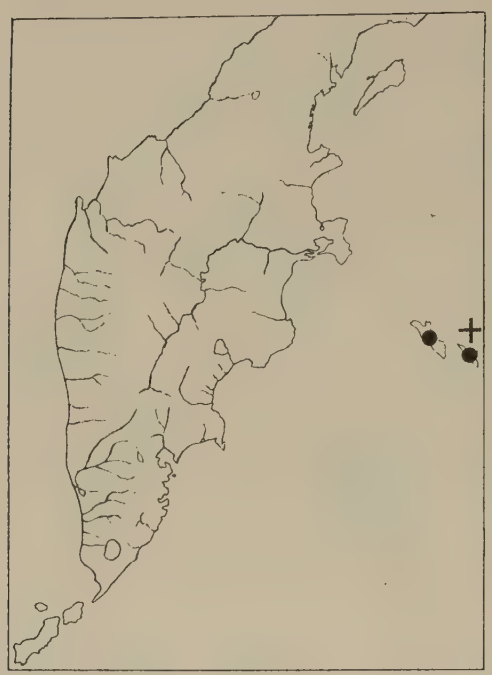
713. *Solidago virgaurea* var. *leiocarpa*



714. *Aster consanguineus*



715. *Aster sibiricus*



716. *Aster Tilesii*



717. *Erigeron acris*



718. *Erigeron elongatus*



719. *Erigeron unalaschkensis*



720. *Antennaria alpina*



721. *Antennaria dioica*



722. *Antennaria monocephala*



723. *Leontopodium* cfr. *linearifolium*



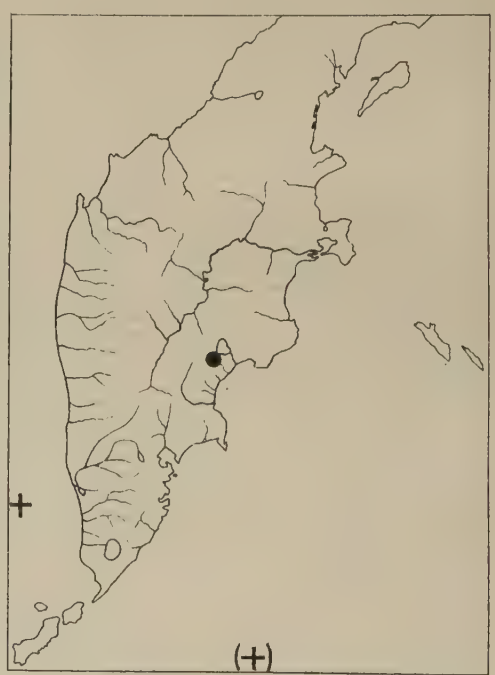
724. *Anaphalis margaritacea* var. *occidentalis*



725. *Gnaphalium uliginosum*



726. *Inula britannica*



727. *Bidens radiata*



728. *Achillaea Millefolium*



729. *Achillaea Ptarmica* subsp. *macrocephala*



730. *Achillaea sibirica*



731. *Matricaria suaveolens*



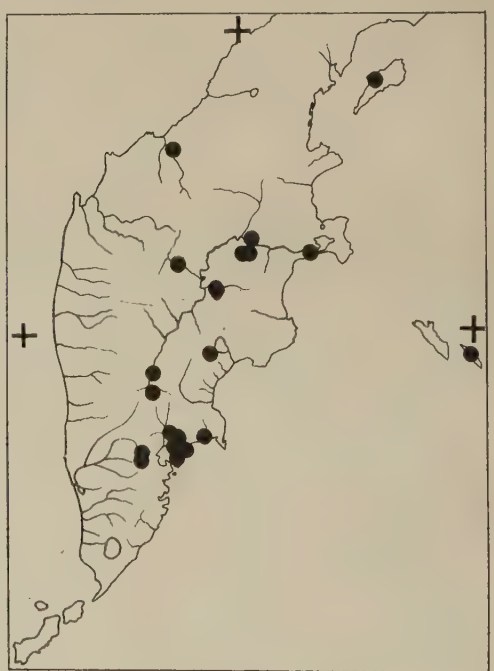
732. *Chrysanthemum arcticum*



733. *Tanacetum vulgare* var. *boreale*



734. *Artemisia arctica*



735. *Artemisia borealis*



736. *Artemisia glomerata*



737. *Artemisia Stelleriana*



738. *Artemisia Tilesii*



739. *Artemisia trifurcata*



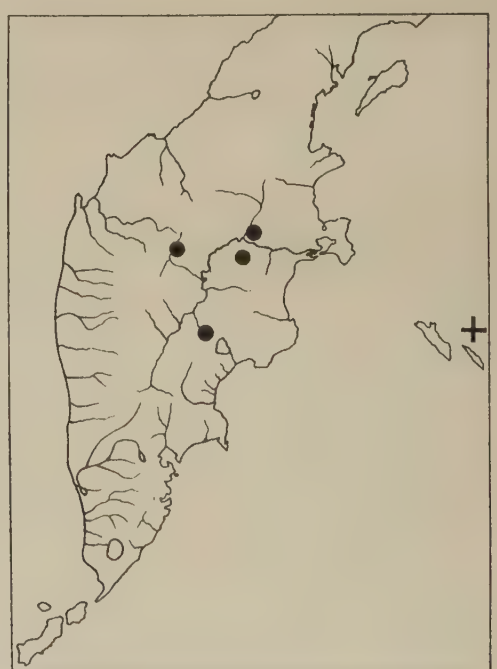
740. *Artemisia ursorum*



741. *Artemisia Verlotorum*



742. *Petasites frigidus*



743. *Arnica Lessingii*



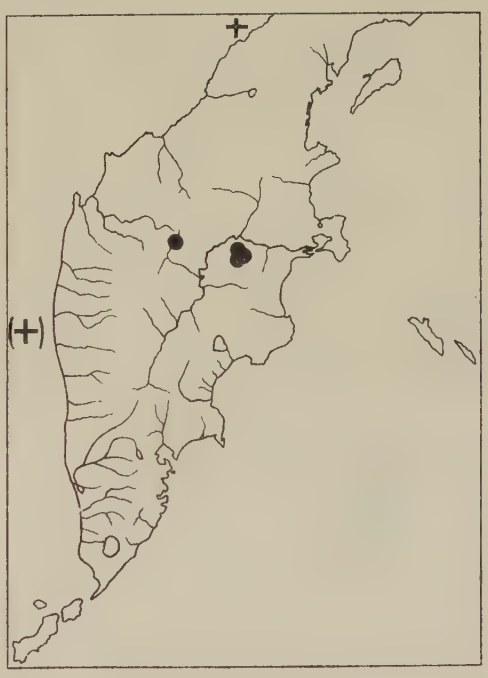
744. *Arnica unalaschcensis*



745. *Cacalia auriculata*



746. *Cacalia hastata*



747. *Senecio frigidus*



748. *Senecio integrifolius*



749. *Senecio Malaisei*



750. *Senecio palmatus*



751. *Senecio palustris* var. *congestus*



752. *Senecio pseudoarnica*



753. *Senecio resedifolius*



754. *Senecio tundricola*



755. *Saussurea oxyodonta*



756. *Saussurea Riederi*



757. *Saussurea subsinuata*



758. *Saussurea Tilesii*



759. *Cirsium kamtschaticum*



760. *Picris hieracioides* subsp. *kamtschatica*



761. ● *Taraxacum acricorne*
762. ○ *Taraxacum albescens*
763. × *Taraxacum dilutum*



764. ● *Taraxacum evittatum*
765. ○ *Taraxacum Hultenii*



766. *Taraxacum kamtschaticum*



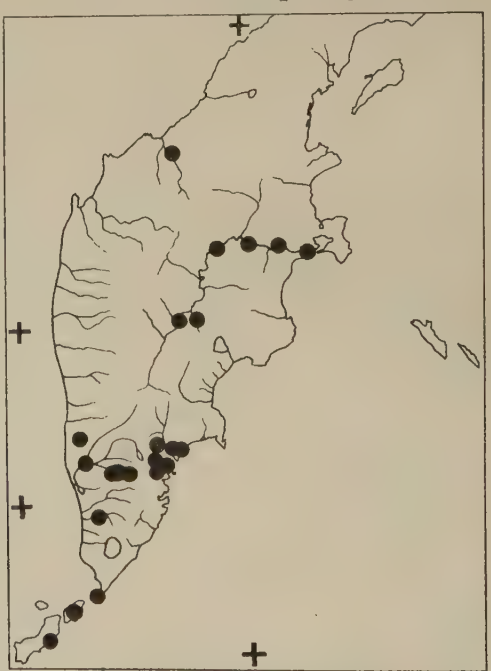
767. ● *Taraxacum latisquameum*
768. ○ *Taraxacum leptoceras*
770. × *Taraxacum perlatescens*



771. ● *Taraxacum platyceras*
772. ○ *Taraxacum platycranum*
773 × *Taraxacum pseudoglabrum*



774. ● *Taraxacum rubiginans*
775. ○ *Taraxacum rufum*
776. × *Taraxacum trigonolobum*



777. *Mulgedium sibiricum*



778. *Lactuca repens*



779. *Crepis chrysantha*



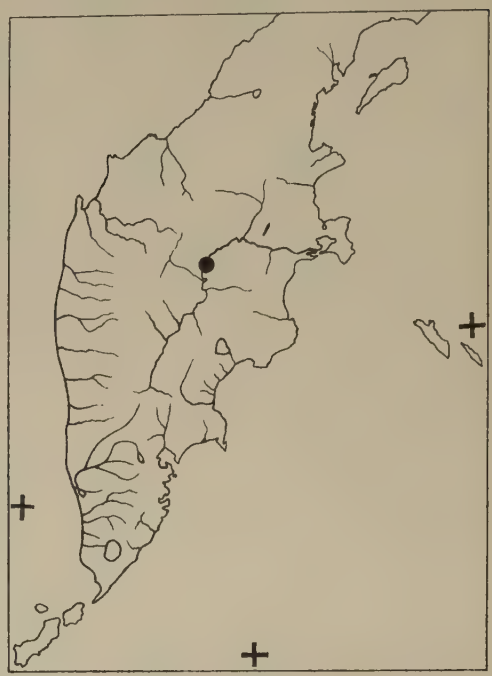
780. *Crepis tectorum*



781. *Hieracium triste*



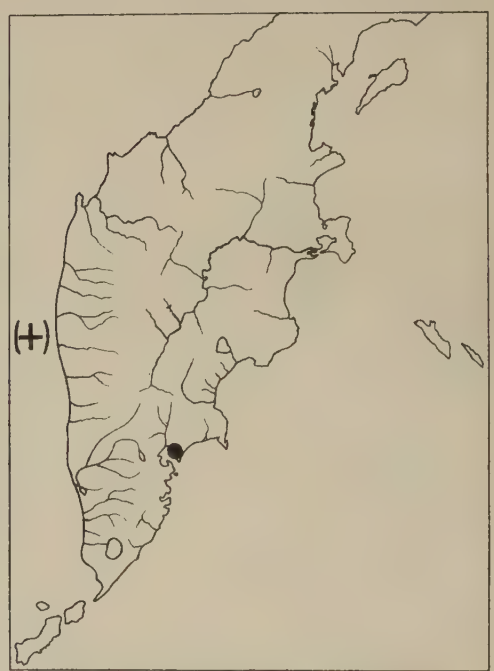
782. *Hieracium umbellatum*



783. (Suppl. No. 1.) *Polypodium vulgare*



784. (Suppl. No. 2.) *Carex laxa*



785. (Suppl. No. 3.) *Juncus stygius*



786. (Suppl. No. 4.) *Luzula rufescens*



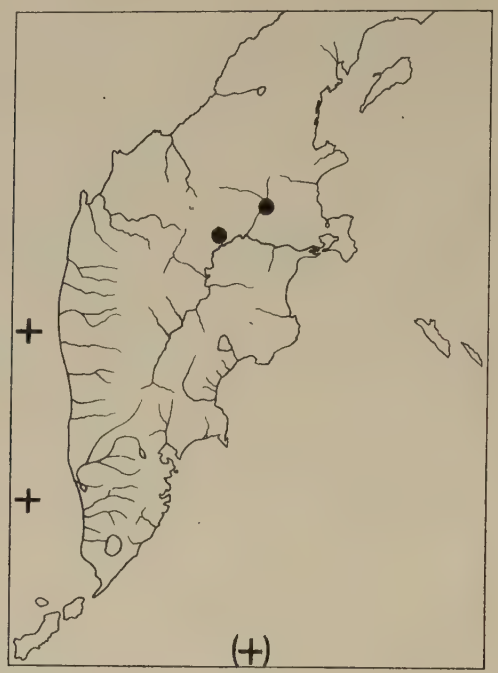
787. (Suppl. No. 5.) *Hemerocallis Middendorffii*



788. (Suppl. No. 6.) *Ranunculus nivalis*



789. (Suppl. No. 7.) *Ranunculus subsimilis*



790. (Suppl. No. 8.) *Oxalis Acetosella*



In order to facilitate the forming of a proper judgment as to the significance of the dots in the maps of distribution a special map of all localities where botanical collections were made is given here.

● Place where a large collection was made
◉ Place where a small collection was made
○ Place where single or only a few specimens were collected

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of Latin names.

No reference is made to the Latin names used for characterizing plant communities. The *Arabic figures* refer, unless otherwise stated, to the pages. The *Roman figures* I—IV indicate the four parts of the work. (I, Kungl. Sv. Vet. Akad. Handl. Ser. 3 Bd. 5 1927 No. 1; II, loc. cit. No. 2; III, loc. cit. Bd. 8 1929 No. 1; IV, the present section; IV Suppl., »Additions and Corrections» at the end of this paper.) It may be observed that the maps of distribution at the end of each part bear the same number as the species they concern.

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